

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROCHIP TECHNOLOGY INC.,
Petitioner,

v.

APTIV TECHNOLOGIES AG,
Patent Owner

PGR2024-00011
Patent No. 11,681,643

APTIV TECHNOLOGIES AG'S NOTICE OF APPEAL

via P-TACTS
Patent Trial and Appeal Board

via Email
Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
efileSO@uspto.gov

via CM/ECF
United States Court of Appeals for the Federal Circuit

INTRODUCTION

Aptiv Technologies AG’s (“Aptiv”) appeal stems from the Patent Trial and Appeal Board’s Final Written Decision (Paper 54) (the “Final Written Decision”), entered on July 9, 2025, in the above-captioned post grant review of United States Patent No. 11,681,643 (“the ’643 patent”). Aptiv requested Director Review of the Final Written Decision, and Director Review was denied on September 18, 2025 (Paper 62). This notice is timely filed within 63 days of denial of Director Review of the Final Written Decision. 37 C.F.R. §§ 90.3(a)(1), 42.75(e)(3).

APTIV TECHNOLOGIES AG’S APPEAL

Please take notice that—under 35 U.S.C. §§ 141(c), 142, 319; 37 C.F.R. §§ 90.2(a), 90.3(a), 42.75(e)(3); and Federal Rule of Appellate Procedure/Federal Circuit Rule 15—Aptiv hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision and all underlying decisions and orders in this action on which that decision is based.

APTIV TECHNOLOGIES AG’S ISSUES ON APPEAL

Aptiv’s issues on appeal include at least (37 C.F.R. § 90.2(a)(3)(ii)):

- (1) the Board’s conclusion that challenged claims 1-15 of the ’643 patent had been proven unpatentable;
- (2) any findings, analysis, or determinations supporting or related to that issue, including but not limited to (a) the Board’s analysis of the Petition and prior

art, and its determination that the Petition set forth, with particularity and adequate evidentiary support, an operable combination that met the requirements of the challenged claims; (b) the Board's analysis and determinations of motivation and reasonable expectation of success; and (c) the Board's analysis of nexus and secondary considerations of non-obviousness, and its decision not to apply the presumption of nexus; and

(3) all other issues decided adversely to Aptiv in any orders, decisions, rulings, or opinions in this action.

Simultaneously with this submission, Aptiv is filing a true and correct copy of this Notice of Appeal with the Director of the United States Patent and Trademark Office and a true and correct copy (or copies) of the same, along with the required filing fee, with the Clerk of the United States Court of Appeals for the Federal Circuit as set forth in the accompanying Certificate of Filing.

Dated: November 17, 2025

Respectfully submitted,

By: /s/ Alex S. Yap

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CERTIFICATE OF FILING

The undersigned hereby certifies that, in addition to being electronically filed through P-TACTS, a true and correct copy of the above APTIV TECHNOLOGIES AG'S NOTICE OF APPEAL is being filed via email with the Director on November 17, 2025, at efileSO@uspto.gov, the email address indicated on the United States Patent and Trademark Office's web page for the Office of the General Counsel.

The undersigned also hereby certifies that a true and correct copy (or copies) of the above APTIV TECHNOLOGIES AG'S NOTICE OF APPEAL and the filing fee is being filed via CM/ECF with the Clerk's Office of the United States Court of Appeals for the Federal Circuit on November 17, 2025.

Dated: November 17, 2025

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that on November 17, 2025, the above
APTIV TECHNOLOGIES AG'S NOTICE OF APPEAL was served in its entirety
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROCHIP TECHNOLOGY INC.,
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v.

APTIV TECHNOLOGIES AG,
Patent Owner.

PGR2024-00011
Patent 11,681,643 B2

Before JEAN R. HOMERE, TERRENCE W. McMILLIN, and
JOHN D. HAMANN, *Administrative Patent Judges*.

HOMERE, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision

Determining All Challenged Claims Unpatentable

35 U.S.C. § 318(a)

Denying Patent Owner's Motion to Strike

37 C.F.R. § 23(b)

Denying Petitioner's Motion to Exclude

37 C.F.R. § 42.64(c)

I. INTRODUCTION

A. Background

Microchip Technology Inc. (“Petitioner”) filed a Petition requesting post-grant review of claims 1–15 of U.S. Patent No. 11,681,643 (Ex. 1011, “the ’643 patent”). Paper 1 (“Pet.”), 1. Aptiv Technologies AG (“Patent Owner”) filed a Preliminary Response. Paper 9 (“Prelim. Resp.”). Upon consideration of the parties’ contentions and supporting evidence, we instituted a post-grant review pursuant to 35 U.S.C. § 324, as to all the challenged claims of the ’643 patent with respect to all grounds set forth in the Petition. Paper 12 (“Inst. Dec.”).

After institution of trial, Patent Owner filed a Response (Paper 25, “PO Resp.”); Petitioner filed a Reply to Patent Owner’s Response (Paper 30, “Pet. Reply”); and Patent Owner filed a Sur-Reply to Petitioner’s Reply (Paper 40, “PO Sur-Reply”).

In addition, Patent Owner filed a Motion to Strike (Paper 35, “PO Mot. Strike”); Petitioner filed an Opposition to Patent Owner’s Motion to Strike (Paper 36, “Pet. Opp. Mot. Strike”); and Patent Owner filed a Reply (Paper 37, “PO Reply Opp. Mot. Strike”). Finally, Petitioner filed a Motion to Exclude Evidence (Paper 43, “Pet. Mot. Excl.”); Patent Owner filed an Opposition to Petitioner’s Motion to Exclude Evidence (Paper 45, “PO Opp Mot. Excl.”); and Petitioner filed a Reply (Paper 46, “Pet. Reply Opp. Mot. Excl.”).

At the request of both parties, we held an oral hearing on April 17, 2025. A transcript of the hearing has been entered into the record. Paper 53 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(b)(4) and § 318(a). This Decision is a final written decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of claims 1–15 of the ’643 patent. For the reasons discussed below, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 1–15 of the ’643 patent are unpatentable.

B. Real Parties in Interest

Petitioner identifies itself and its subsidiaries as real parties in interest. Pet. 110.

Patent Owner identifies itself and Aptiv Services US, LLC as real parties in interest. Paper 4, 2.

C. Related Matters

The parties indicate that the ’643 patent is the subject of the following district court proceeding:

Aptiv Technologies AG v. Microchip Technology Inc., Case No. 1:23-cv-00307-JDW (D. Del. March 20, 2023) (“the Delaware litigation”).

Pet. 110; Paper 7, 1. The parties note other petitions for *inter partes* review filed by Petitioner and challenging patents owned by Patent Owner.

Pet. 110; Paper 7, 1–2. More particularly, Petitioner filed petitions for *inter partes* review as follows:

PTAB Proceeding	Patent
IPR2024-00228	9,619,420
IPR2024-00229	9,645,962
IPR2024-00230	11,176,072
IPR2024-00494	9,460,037
IPR2024-00495	9,619,420
IPR2024-00496	10,545,899
IPR2024-00558	9,460,037

Pet. 110; Paper 7, 1–2.

D. The Challenged '643 Patent

The '643 patent relates to a method to enable a vehicle's embedded USB (Universal Serial Bus) host system to connect to multiple mobile devices through a USB hub, regardless of whether the mobile devices are configured to act as USB hosts or USB devices, without USB On the Go (OTG) controllers or additional vehicle wiring or inhibiting the functionality of any consumer devices connected to the same USB hub. Ex. 1011, code (57).

The '643 patent explains that historically

USB protocols require a point-to-point connection in which one end is the USB Host or master, and the other end is a USB Device or slave. In this way, the flow of messages between the two devices is managed and controlled, whereby the USB Device responds to messages initiated by the USB Host.

Id. at 1:38–43. The '643 patent further describes that in vehicle systems that employ USB connections, the vehicle is typically the USB host and the USB host function is often embedded into a component of the vehicle

infotainment system, such as into the radio or other control module.

Id. at 1:50–54.

As described in the '643 patent, leading mobile device manufacturers and system designers began designing their mobile device products (such as smartphones) to support both USB host and USB device roles. *Id.* at 2:55–66. In other words, a phone may configure itself such that it can function as a USB device or as a USB host as necessary. *Id.*

If a phone acts as a USB host, then the vehicle system will not function because, by USB convention, two USB hosts cannot directly connect with each other. *Id.* at 3:8–20. The '643 patent states that existing solutions to this problem such as On the Go (OTG) technology and dynamic swapping of ports have disadvantages. *Id.* at 3:21–4:3. The '643 patent summarizes the invention as follows:

[A] system which can be employed between a vehicle's embedded USB Host and at least one, but preferably multiple, consumer facing USB ports provided in the vehicle for connection to consumer devices. The system is configured to recognize and control whether the consumer device is required to be connected to each USB port as a USB Host or as a USB Device. Further, the system is able to dynamically switch the device connection between USB Device mode and USB Host mode when desired. In the case where the consumer device is acting as a USB Device, signals are routed normally through a USB Hub to the Head Unit. In the case where the consumer device is acting as a USB Host, signals between the consumer device and the vehicle's embedded USB Host are routed and processed through a USB Host to Host Bridge which is connected to the USB Hub, thereby rendering the consumer device compatible with the vehicle's embedded USB Host.

Id. at 4:16–33.

Figure 4, reproduced below, illustrates a USB hub module having a USB hub IC (integrated circuit), a USB bridge IC, and a switching device having switches. *Id.* at 5:24–27.

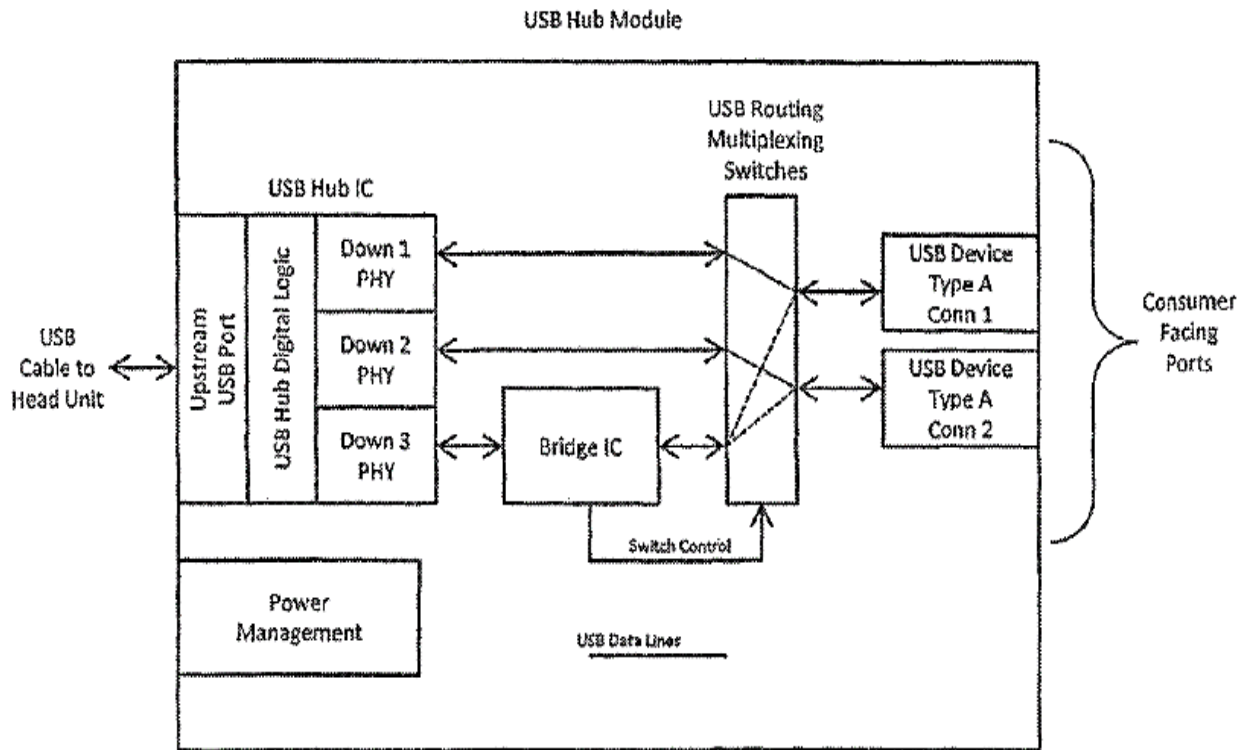


Figure 4, above, depicts a system configured to render a vehicle's embedded USB host compatible with consumer devices configured to act as a USB host or as a USB device. *Id.* at 5:50–53. The system is in the form of a USB hub module having a USB hub IC (integrated circuit), a USB bridge IC, and a switching device having switches. *Id.* at 5:53–56. The USB hub IC is configured to be connected (via an upstream USB port) to a vehicle's embedded USB host (such as a USB host in a head unit) via vehicle internal wiring. *Id.* at 5:56–60.

The USB hub IC also includes three downstream USB ports, one of which is connected to the switching device (e.g., multiplexing switches) via the USB bridge IC. *Id.* at 5:61–65. The other two downstream USB ports of

the USB hub IC are connected directly to the switching device, thereby bypassing the bridge IC. *Id.* at 5:65–67. The switches are connected to two USB ports in the vehicle, for connection to a consumer device. *Id.* at 6:1–5. The USB bridge IC effectively controls the switches. *Id.* Therefore, the USB hub module is configured such that signals received from a consumer device via a USB port are received by the switching device, which routes the signals to the USB hub IC directly or via the USB bridge. *Id.* at 6:5–8.

In the case where the consumer device is acting as a USB host, the switching device receives the USB packets from the consumer port, routes the packets to the USB bridge IC, which processes and forwards them to the USB hub IC, thereby rendering the consumer device compatible with the vehicle’s embedded USB host. *Id.* at 6:8–13. In the case where the consumer device is acting as a USB device, the USB bridge IC controls the switching device such that the switching device provides the USB signaling directly to the USB hub, bypassing the bridge. *Id.* at 6:13–17.

“The architecture illustrated is capable of handling both the operation and data paths associated with the Bridge and the Hub at the same time, thus allowing concurrent operation of consumer devices operating in USB Device mode with consumer devices operating in USB Host mode.” *Id.* at 8:63–67.

E. The Challenged Claims

Petitioner challenges claims 1–15 of the ’643 patent. Pet. 1. Claims 1, 5, and 10 are independent. Ex. 1011, 9:15–10:59. Claims 2–4 depend on independent claim 1; claims 6–9 depend on independent claim 5, and 11–15 depend on independent claim 10. *Id.* Claim 1 is illustrative of the challenged claims and is reproduced below.

1. A method, comprising:
 - [1a] providing a first USB port for communication with a USB host;
 - [1b] providing a second USB port for communicating with a consumer USB device;
 - [1c] providing a signal detection circuit for receiving USB signals from the consumer USB device via the second USB port;
 - [1d] routing the USB signals emanating from the consumer USB device to the first USB port via a routing logic circuit connected directly to a USB bridge and a USB hub connected to the USB bridge in accordance with a determination by the signal detection circuit that the consumer device is operating in a USB host mode, wherein the USB bridge includes a bridge controller, buffers, and a plurality of ports; and
 - [1e] routing the USB signals emanating from the consumer USB device to the first USB port via the routing logic connected directly to the USB hub and thereby bypassing the USB bridge in accordance with a determination by the signal detection circuit that the consumer device is operating in a USB device mode, wherein the USB hub and USB bridge have different components and functionality.

Ex. 1011, 9:15–39.

F. Prior Art and Asserted Grounds of Unpatentability

The Petition relies on the following prior art references:

Name	Reference	Exhibit
Chang	US Pub. 2006/0206650 A1, published September 14, 2006	1014
Chang II	US Pub. 2009/0268743 A1, published October 29, 2009	1015

Name	Reference	Exhibit
Chutorash	US Pat. 8,447,598 B2, issued May 21, 2013	1029

Petitioner asserts claims 1–15 are unpatentable based on the following grounds (Pet. 5–6):

Ground	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	1–15	103 ¹	Obviousness over Chang in view of Chang II and POSITA Knowledge
2	2, 7, 13	103	Obviousness over Chang in view of Chang II, Chutorash, and POSITA Knowledge
3	1–15	112(b)	Indefinite
4	1–15	112(b)	Indefinite
5	1–9	112(b), 112(f)	Indefinite
6	4, 9, 15	112(b)	Indefinite
7	4, 9, 15	112(a)	Written Description

Pet. 5–6.

In support of its contentions, Petitioner submits Declarations by Eric Welch (Exs. 1013, 1102), Jeffrey L. Ravencraft (Ex. 1024), Mariellen F. Calter (Ex. 1058), and John Phillips (Ex. 1104), and Affidavits of Nathaniel

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. § 103. Because the challenged claims of the ’643 patent have an effective filing date no earlier than September 26, 2013, which is after the effective date of the applicable AIA amendments, we refer to the AIA version of 35 U.S.C. § 103 in this Decision.

E Frank-White (Exs. 1061, 1062, 1065). Likewise, Petitioner submits Deposition Transcripts by Henry Houh (Exs. 1084, 1085).

In response, Patent Owner submits Declarations by Henry Houh (Exs. 2001, 2019) and Michael Dreon (Ex. 2036). Further, Patent Owner submits Deposition Transcripts of Eric Welch (Ex. 2021, 2048).

G. Eligibility for Post-Grant Review

As a threshold matter, we must determine whether the '643 patent is eligible for post-grant review. The post-grant review provisions in section 6(d) of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (September 16, 2011) ("AIA") apply only to patents that "contain[] or contained at any time . . . a claim to a claimed invention that has an effective filing date . . . that is on or after [March 16, 2013]." AIA §§ 3(n)(1), 6(d), 6(f)(2)(A), 125 Stat. 284, 293, 305–312 (2011).

Each petitioner for post-grant review must certify that the challenged patent is available for post-grant review. 37 C.F.R. § 42.204(a). In addition, "[a] petition for a post-grant review may only be filed not later than the date that is 9 months after the date of the grant of the patent or of the issuance of a reissue patent (as the case may be)." 35 U.S.C. § 321(c). Petitioner has the burden to demonstrate eligibility for post-grant review. *See Mylan Pharms. Inc. v. Yeda Res. & Dev. Co.*, PGR2016-00010, Paper 9 at 10 (PTAB Aug. 15, 2016).

Petitioner certifies under 37 C.F.R. § 42.204(a) that the '643 patent is available for post-grant review. Pet. 4. Petitioner also certifies "petitioner is not barred or estopped from requesting a *post-grant* review challenging the patent claims on the grounds identified in the petition." *Id.* Patent Owner

does not address post-grant review eligibility of the '643 patent in its Response.

On this record, we determine that the '643 patent is eligible for post-grant review. The '643 patent's earliest claimed effective filing date is September 26, 2013 (the filing date of a provisional application to which the '643 patent claims priority), which is after March 16, 2013. Ex. 1011, code (60). In addition, the Petition's filing date, December 27, 2023 (Paper 6, 1), is not later than nine months after the '643 patent's grant date of June 20, 2023. Ex. 1011, code (45).

II. PATENTABILITY ANALYSIS

A. Principles of Law

1. Post-Grant Review

"In a post-grant review . . . the petitioner shall have the burden of proving a proposition of unpatentability by a preponderance of the evidence." 35 U.S.C. § 326(e). This burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (*inter partes* review proceeding).

2. Obviousness

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention, as a whole, would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the

basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) when in evidence, any objective evidence of nonobviousness.² *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art (“POSITA”) is a hypothetical person presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In determining the level of ordinary skill in the art, we may consider certain factors, including: “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Best Med. Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022). “The patent’s purpose can also be informative.” *Id.*

Petitioner contends:

A POSITA at the time of the alleged invention would have been well-versed in USB standards (including the USB 2.0 and 3.0 Specifications and the OTG Supplement) and the design/deployment of USB hosts, USB devices, and USB hubs, including suitable environments for USB systems. A POSITA

² We have considered the arguments and evidence set forth in Section VII.H of the Petition, Section IX of Patent Owner’s Response, Section V of Petitioner’s Reply, and Section VII of Patent Owner’s Sur-Reply.

would also have had a working understanding of network/communication architectures (*e.g.*, master/slave) and components (*e.g.*, host-to-host bridges), computer hardware and peripherals, computer programming, and the design/implementation of communication software/firmware/drivers in standard operating systems (*e.g.*, Windows and Linux) and embedded systems. Welch, ¶¶45-49.

A POSITA would have had at least a four-year degree in electrical engineering, computer engineering, computer science, or a related field and substantial experience (*e.g.*, several years) designing USB systems, including USB hosts, USB hubs, and USB devices. A relevant advanced degree may substitute for some work experience. Welch, ¶¶45-49. Similarly, relevant work experience may substitute for formal education.

Pet. 28–29.

Patent Owner contends:

At the time of the invention, a POSITA would have had a bachelor’s degree in computer science, electrical engineering, or an equivalent, and two years of professional experience working with computer network protocols such as USB. (EX2019, ¶ 26.) Lack of work experience can be remedied by additional education, and vice versa. (EX2019, ¶ 26.)

PO Resp. 3–4.

Patent Owner argues that “Petitioner proposes an elevated and specific level of ordinary skill that requires fluency with specialized documents and technologies, including particular USB standards documents.” PO Resp. 4. Patent Owner asserts that Petitioner’s artificially heightened definition of a POSITA should be rejected. *Id.*

Petitioner contends that the parties agree on education, that some education/work experience can trade off, and that some work experience is necessary. Pet. Reply 2. Petitioner argues, however, that “PO’s statement regarding experience ‘with computer network protocols *such as USB*’ is

fuzzy. . . . [i]f PO means no USB knowledge/experience is necessary, Petitioner disagrees.” Pet. Reply 3. Petitioner further argues the prior art (e.g., Chang and Chang II) supports Petitioner’s assertion regarding USB familiarity. *Id.*

We define the level of skill in the art based upon those aspects of the definition as to which the parties agree and the evidence in the supporting declarations upon which the parties rely. We agree with Patent Owner’s arguments that Petitioner’s definition is artificially heightened in that it requires the POSITA to be well-versed in and to have substantial experience in USB standards and systems. PO Resp. 4. As an initial matter, we note that Patent Owner’s proposed definition of the POSITA is adopted from paragraph 26 of the Supplemental Declaration of Henry Houh. Ex. 2019 ¶ 26. Further, the declaration indicates that the opinions expressed by Mr. Houh regarding the level of the POSITA are based on Mr. Houh’s industry experience hiring and managing technical personnel in the computer networking field, and his understanding of the basic qualifications that would be relevant to an individual tasked with investigating methods and systems in the relevant area, and his familiarity with the backgrounds of colleagues both past and present. *Id.* ¶ 29. Although Petitioner’s proposed definition of the POSITA is likewise adopted from the declaration of Petitioner’s Expert (i.e., Mr. Eric Welch’s Declaration), said declaration does not indicate what constitutes the basis of the opinions expressed therein by Mr. Eric Welch regarding the level of the POSITA. Ex. 1013 ¶ 47. Furthermore, Petitioner does not provide any explanation or reasoning in the cited declaration to support the proposed definition of the POSITA. On the record before us, we do not find sufficient evidence to substantiate

Petitioner’s proposed definition that “A POSITA at the time of the alleged invention would have been well-versed in USB standards (including the USB 2.0 and 3.0 Specifications and the OTG Supplement) and the design/deployment of USB hosts (including embedded hosts), USB devices, and USB hubs (including embedded Hubs),¹ including suitable environments for USB systems.” *Id.* Nor do we find any evidence that the POSITA would have also had “four years of experience designing USB systems, including USB hosts, USB hubs, and USB devices.” *Id.*

We find Patent Owner’s proposed definition of the POSITA to be consistent with the problems and solutions disclosed in the ’643 patent and prior art of record. *See, e.g., In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (approving the determination of the level of ordinary skill in the art by appeal to the references of record). In particular, we agree with Patent Owner that an individual with a four-year degree in electrical or computer engineering, and with a minimum of two years of professional experience working with computer network protocols such as USB would have understood the problems and solutions discussed on the record before us, and would have thereby qualified as a POSITA. PO Resp. 3–4.

Accordingly, for purposes of this Decision, we adopt as our own Patent Owner’s proposed definition of the POSITA.

C. Claim Construction

In a post-grant review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims as

understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.200(b). “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention” and “after reading the entire patent.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313, 1321 (Fed. Cir. 2005) (en banc). In addition to the specification and prosecution history, we also consider use of the terms in other claims and extrinsic evidence including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Id.* at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315.

“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (alteration in original) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

“Petitioner submits that only the terms addressed in Grounds 3-6 (regarding indefiniteness) require construction for this proceeding.” Pet. 29 (footnote omitted). Petitioner does not propose any construction for any term. *Id.*

Patent Owner states “[f]or the purposes of this proceeding, Patent Owner does not contend that any claim construction is required. The claims are not obvious under any reasonable interpretation of the claims.”

PO Resp. 5.

We determine that we do not need to expressly construe any term for purposes of this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). As discussed below, we conclude the claims at issue in Grounds 3 to 6 are definite and we further conclude such terms have their ordinary and customary meaning and express construction is unnecessary.

D. Declaration of Dr. Houh

Petitioner argues “Dr. Houh’s testimony should be given no weight because he: (1) copied his declaration; and (2) lacks the qualifications/knowledge of a POSITA and is not credible.” Pet. Reply 4. In particular, Petitioner contends that “Dr. Houh copied his prior art analysis word-for-word from the POR.” *Id.* (citing Ex. 219 ¶¶ 52–119; Ex. 1091; Exs. 1091–1093; Ex. 1095). According to Petitioner, “copycat declarations-like Dr Houh’s – are entitled to little/no weight. *Id.* at 5 (citing *Xerox Corp et al. v. Bytemark, Inc*, IPR2022-00624, Paper 12, 5 (PTAB Aug. 24, 2022) (precedential)). Petitioner further argues Dr. Houh “is simply not an expert (or POSITA) in the USB technology here.” *Id.* According to Petitioner, because Dr. Houh lacks USB experience to render any opinions under Petitioner’s standards, his testimony should be afforded little to no weight as the PTAB has done in previous IPRs involving Dr. Houh. *Id.* at 5 (citing Ex. 1084, 76:25–77:4, 80:9–19, 82:14–83:7).

Regarding argument (1), we decline to delve into how Dr. Houh’s declaration testimony was prepared. Regarding argument (2), Petitioner’s reliance in part on Dr. Houh’s deposition testimony on page 80, lines 9–19

and page 82, line 14,³ to page 83, line 12 is of little relevance because it relates to whether Dr. Houh qualifies as a POSITA under Mr. Welch's definition, which we do not adopt. *Id.* Further, Dr. Houh testifies that his Ph.D. in networking substitutes for professional experience working with USB. *Id.* As discussed above, under Patent Owner's definition of a POSITA, which we adopted for the purpose of this Decision, we find that Dr. Houh's testimony should be considered in light of his advanced studies in networking coupled with his experience in the field. On this record, we find that Dr. Houh possesses, at a minimum, a working knowledge and understanding network protocols including USB standards and systems to adequately render a learned opinion about the facts before us. Additionally, because the facts in the related IPRs cited by Petitioner are not before us, we decline Petitioner's invitation to rely upon these non-related cases to impugn the validity of Dr. Hugh's testimony in the present proceeding. We therefore find Petitioner's statement that "[b]ecause Dr. Houh lacks USB experience, he rendered no opinions under Petitioner's POSITA standard" to be unsupported by the cited portion of Dr. Houh's testimony. Pet. Reply 5; Ex. 1084, 76:25–77:4.

Accordingly, we are not persuaded by Petitioner's argument that Dr. Houh's testimony should be given no weight.

³ Page 82, line 14, appears to be a typographical error because line 14 is in the middle of an answer.

E. Overview of the Asserted Prior Art

1. Chang (Ex. 1014)

Chang relates to “a hub with a host-to-host transmission function” accomplished via “a bridge connected between the host port and hub control unit” allowing first and second hosts to communicate with each other.

Ex. 1014 ¶¶ 1, 5.

Figure 2 illustrates a conventional USB hub and is reproduced below.
Id. ¶ 13.

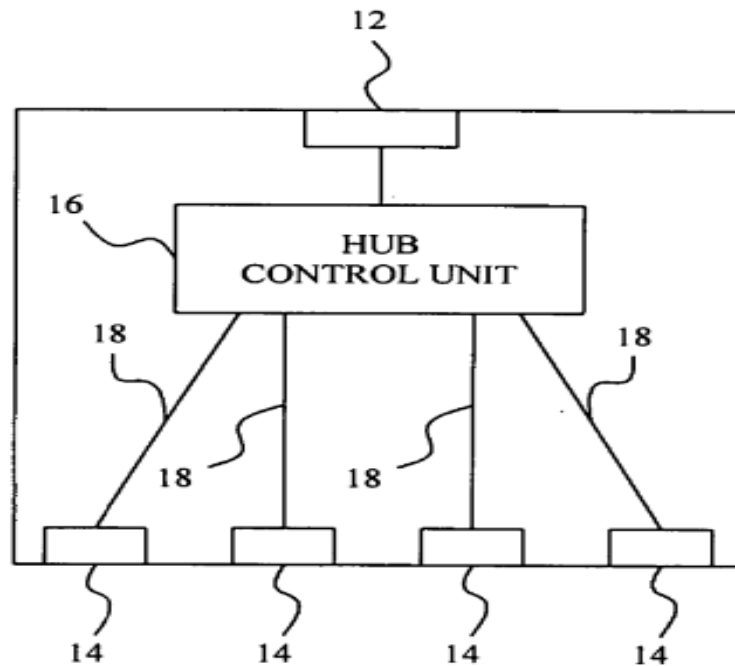


Figure 2 above illustrates a conventional USB hub including uplink port 12 for being linked to a host, downlink ports 14 for being linked to other devices, and hub control unit 16 for establishing communications between the ports. *Id.* ¶ 18. In the conventional USB hub, several transmission paths 18 may be established such that uplink port 12 can communicate with each downlink port 14 as well as devices linked thereto via hub control unit 16. *Id.*

Chang summarizes its invention as follows:

a hub with a host-to-host transmission function comprises a hub control unit, an uplink port connected to the hub control unit for being linked to a first host, a host port for being linked to a second host, and a bridge connected between the host port and hub control unit for the first and second hosts to communicate with each other.

Id. ¶ 5.

Figure 3 illustrates a hub according to the Chang invention, and is reproduced below. *Id.* ¶ 19.

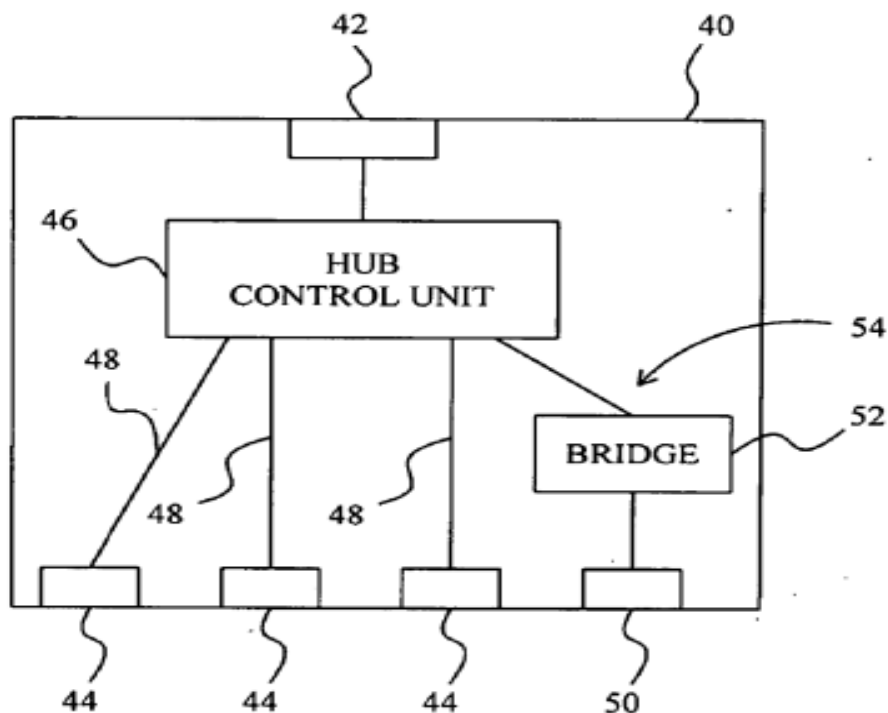


Figure 3 above shows hub 40 including uplink port 42 for being linked to a host, several downlink ports 44 for being linked to consumer devices, and hub control unit 46 for establishing several transmission paths 48 between uplink port 42 and downlink ports 44 such that the host linked to uplink port 42 can communicate with consumer devices linked to downlink ports 44. *Id.* Hub 40 further comprises host port 50 for connecting a

consumer device operating as a host to the host at uplink port 42 via bridge 52 and control hub 46, together forming path 54 enabling host-to-host communications, which may be implemented with a bridge chip. *Id.* ¶¶ 20, 22, 24.

2. Chang II (Ex. 1015)

Chang II relates to a data transmission bridge device including a control chip for transmitting data that adopts USB specification, and can utilize switching to bridge between two host devices for transmitting data. Ex. 1015 ¶ 2. In particular, upon detecting the connecting device type (host/slave), the data transmission bridge device automatically switches between different transmission paths, which not only support data transfer between a host device and a slave device (host-to-device communication), but they also can directly support data transfer between two host devices (host-to-host communication). *Id.* ¶¶ 11, 12.

Figure 1 is a schematic diagram for a data transmission bridge device including a control chip for adaptively transmitting data to a detected connecting device and is reproduced below. *Id.* ¶ 15.

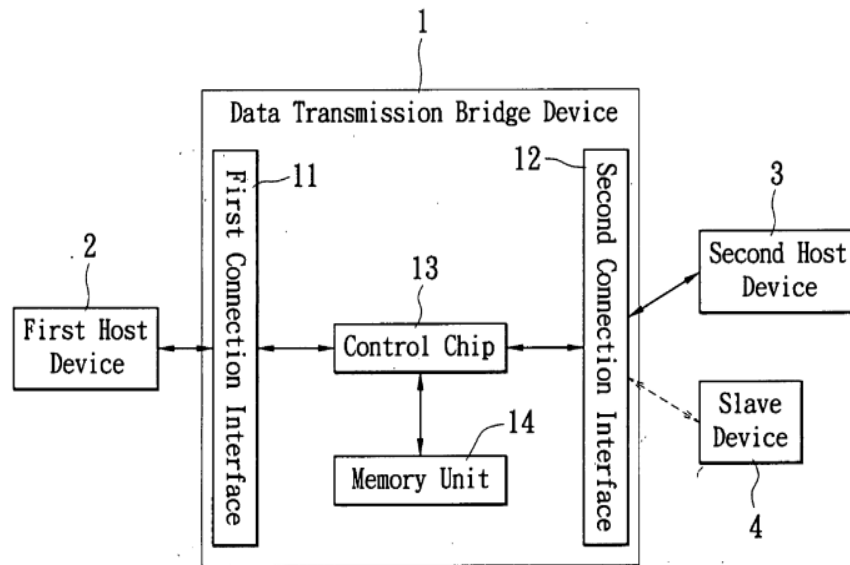


Figure 1 above illustrates data transmission bridge device 1 including first connection interface 11 for connecting to first host device 2, second connection interface 12 for connecting to second host device 3 or slave device 4, control chip 13 enabling connection to a detected host/slave device, and memory unit 14 for storing control data. *Id.* ¶¶ 22, 23.

Figure 5 illustrates a schematic diagram for control chip 13 of data transmission bridge device 1 for adaptively transmitting data to a detected connecting device and is reproduced below. *Id.* ¶¶ 19, 34.

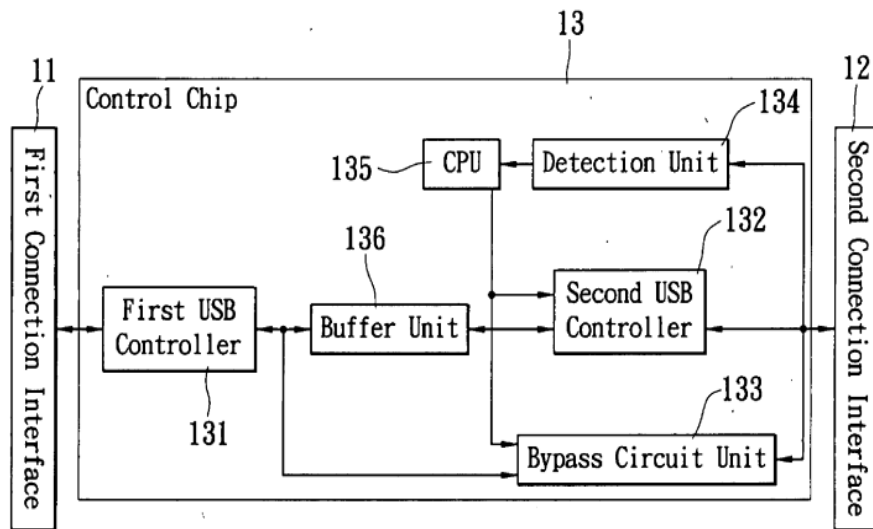


FIG. 5

Figure 5 above shows control chip 13 for data transmission bridge device 1. *Id.* ¶ 34. Chip 13 includes first USB controller 131, second USB controller 132, bypass circuit unit 133, detection unit 134, central processing unit (CPU) 135, and buffer unit 136. *Id.* Upon detecting the type of device currently connected with second connection interface 12, detection unit 134 automatically operates to switch between a virtual host state and a virtual slave state. *Id.* ¶¶ 38, 39. Data transmission bridge device 1 “by automatically detecting the type of connected device to switch between the proper transmission path, can not only support data transmission between a host device and a slave device, but can also directly support data transmission between two host devices.” *Id.* ¶ 46. Chang II discloses that by “automatically detecting the type of device connected (host or slave) the present invention can switch to the proper transmission path” and provide “direct bridging between two host device[s] for data transfer.” Ex. 1015 ¶ 21. And, “the control chip 13 can . . . switch to the bridge transmission path or the bypass path.” *Id.* ¶ 24.

3. *Chutorash* (Ex. 1029)

Chutorash describes a need for improved user interface features and/or connectivity features relating to vehicle control systems, remote sources, and/or portable devices. Ex. 1029, 1:34–39.

Figure 3 is a cutaway perspective view of a portable electronic device coupled to a vehicle control system and is reproduced below. *Id.* at 3:52–54.

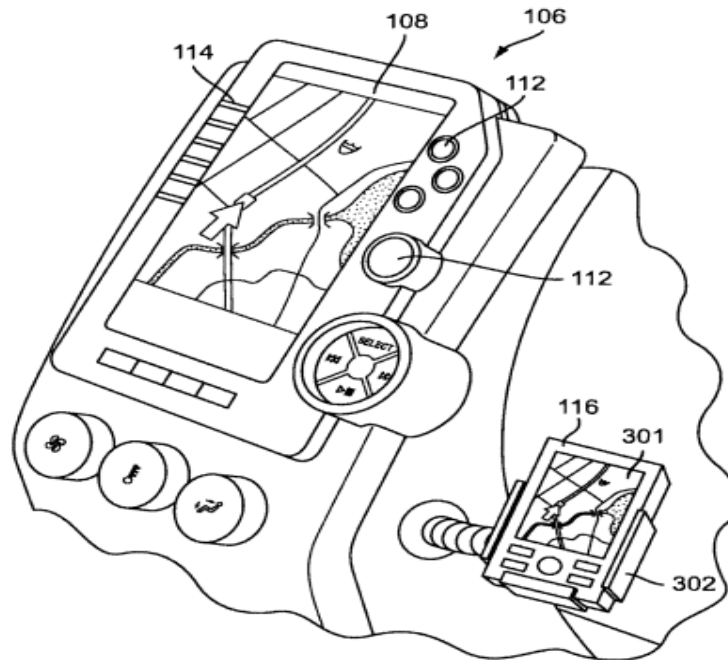


Figure 3 above shows portable electronic device 116 near and in communication with vehicle control system 106. *Id.* at 6:51–67. Vehicle control system 106 may comprise a media system, navigational system, entertainment system, display system, communications systems, etc. *Id.* at 5:27–42.

Figure 27 depicts a block diagram of vehicle control system 106 including components for USB connectivity with a portable electronic device and is reproduced below. *Id.* at 4:58–61, 27:1–31 (“[v]ehicle control system 106 could be classified as an embedded host”).

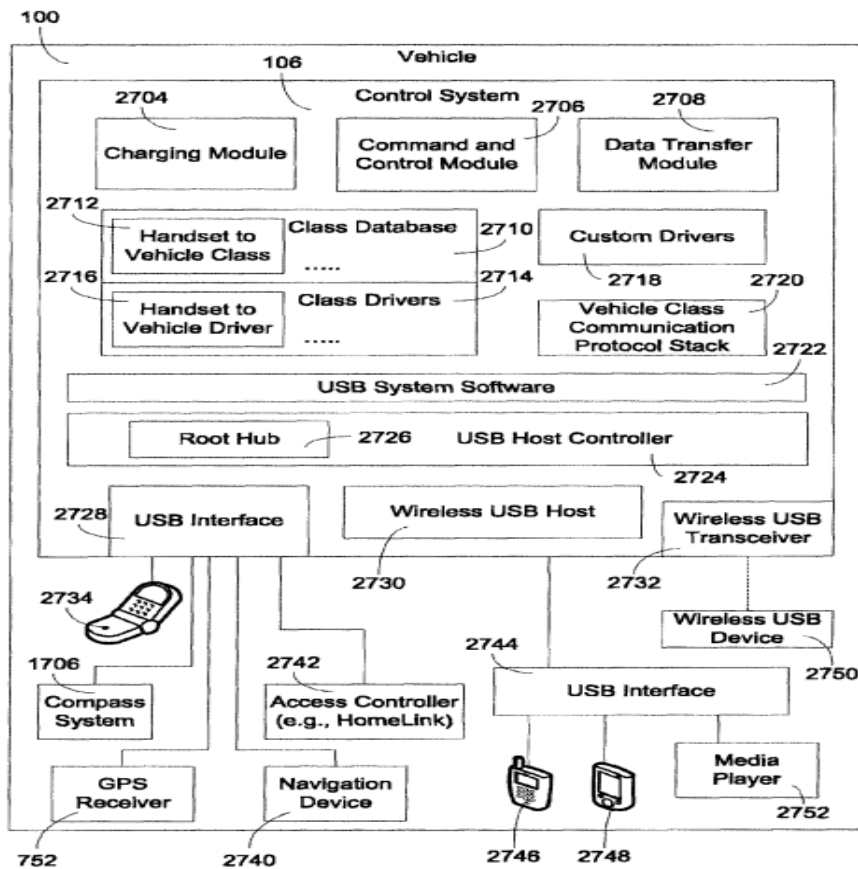


Figure 27 above shows a block diagram of vehicle control system 106 having USB connectors or interfaces 2728 and 2744 within vehicle 100. *Id.* at 27:1–31. Interface 2728 is embedded in vehicle control system 106 and interface 2744 is coupled to vehicle control system 106. *Id.*

F. Obviousness over Chang in view of Chang II (Ground 1)

Petitioner argues that claims 1–15 are obvious over Chang in view of Chang II. Pet. 5, 42–85. Patent Owner opposes. PO Resp. 12–48. Upon consideration of Petitioner’s explanations and supporting evidence on the record before us, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that the challenged claims would have been

obvious over the combination of Chang and Chang II. Our analysis below focuses on the disputed claim elements and contested issues.

1. The Preamble

Independent claim 1 recites “[a] method, comprising.” Ex. 1011, 9:15.

Petitioner argues that, to the extent the preamble is limiting, Chang teaches these limitations.⁴ Pet. 52. According to Petitioner, the substantive analysis of Ground 1 renders it obvious. *Id.*

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp. Nonetheless, the burden of persuasion remains on Petitioner to demonstrate unpatentability. 35 U.S.C. § 326(e); *see also Dynamic Drinkware, LLC*, 800 F.3d at 1378.

Without determining whether the preamble is limiting, we have reviewed Petitioner’s un rebutted arguments and the underlying evidence, and we find that Petitioner has shown by a preponderance of the evidence that Chang (and, thus, the combination of Chang with Chang II) teaches the subject matter of the preamble.

⁴ “In general, a preamble limits the invention if it recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (quoting *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). “[A]s a general rule preamble language is not treated as limiting.” *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, 672 F.3d 1335, 1347 (Fed. Cir. 2012) (citing *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002)).

2. Step 1a first USB port for communication with a USB host

Independent claim 1 further recites “providing a first USB port for communication with a USB host.” Ex. 1011, 9:16–17.

Petitioner argues that Chang teaches these limitations. Pet. 53 (citing Ex. 1014 ¶ 19; Ex. 1013 ¶ 222) (asserting that Chang’s explicit disclosure of “an uplink port 42 for being linked to a host,” teaches this step).

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

We have reviewed Petitioner’s unrebutted arguments and the underlying evidence, and we find that Petitioner has shown by a preponderance of the evidence that Chang (and, thus, the combination of Chang with Chang II) teaches the limitations in step 1a.

3. Step 1b second USB port for communicating with a consumer USB device

Independent claim 1 further recites “providing a second USB port for communicating with a consumer USB device.” Ex. 1011, 9:18–19.

Petitioner argues that Chang teaches these limitations. Pet. 54–55 (citing Ex. 1014 ¶¶ 19–21, 42–44; Ex. 1013 ¶¶ 223, 224) (asserting that it would have been obvious to implement Chang’s downlink host port 50 as a dual-role port operating in either host or device mode).

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

We have reviewed Petitioner’s unrebutted arguments and the underlying evidence, and we find that Petitioner has shown by a preponderance of the evidence that Chang (and, thus, the combination of Chang with Chang II) teaches the limitations in step 1b.

4. Step 1c signal detection circuit for receiving USB signals from the consumer USB device

Independent claim 1 recites “providing a signal detection circuit for receiving USB signals from the consumer USB device via the second USB port.” Ex. 1011, 9:20–22.

Petitioner argues that Chang II teaches these limitations. Pet. 56–58 (citing Ex. 1015 ¶¶ 34, 38–40, 42–44; Ex. 1013 ¶¶ 226–230) (asserting that Chang II’s detection unit comprised in the control chip, upon receiving a signal from a device connected to a downstream port/second connection interface, automatically identifies the connected device type as a host or a slave device). According to Petitioner, Chang II’s “detection results would control the mux select line.” *Id.* at 57.

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

We have reviewed Petitioner’s unrebutted arguments and the underlying evidence, and we find that Petitioner has shown by a preponderance of the evidence that Chang II (and, thus, the combination of Chang with Chang II) teaches the limitations in step 1c.

5. Step 1d Routing . . . in a USB Host mode

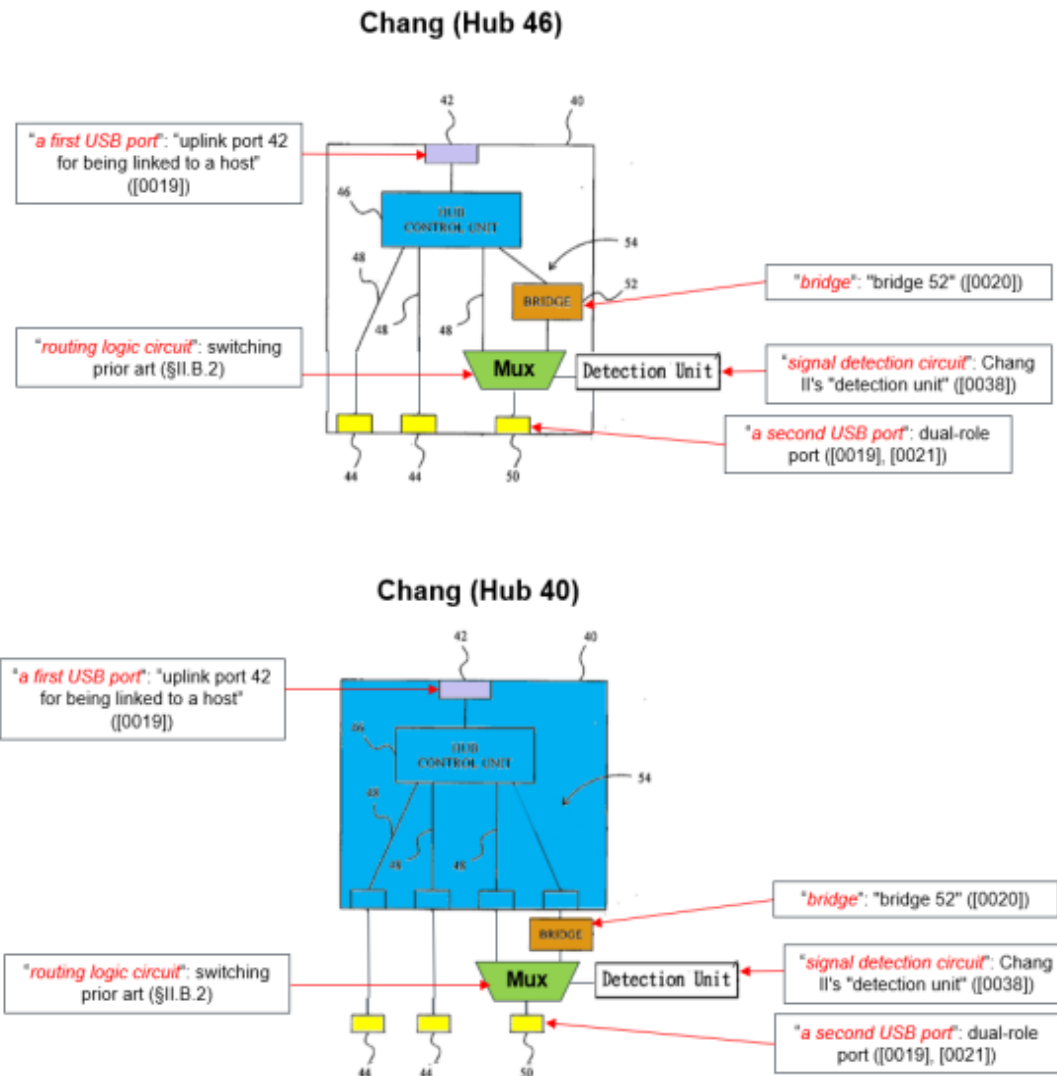
Independent claim 1 recites:

routing the USB signals emanating from the consumer USB device to the first USB port via a routing logic circuit connected directly to a USB bridge and a USB hub connected to the USB bridge in accordance with a determination by the signal detection circuit that the consumer device is operating in a USB host mode, wherein the USB bridge includes a bridge controller, buffers, and a plurality of ports.

Ex. 1011, 9:23–30.

a. Petitioner's Contentions

Petitioner contends a POSITA would have been motivated to implement dual-role ports by modifying Chang to include a switch (e.g., a multiplexer) to select the appropriate transmission path to connect a dual-role port (i) directly to the hub's upstream port (when the consumer product is in device mode, i.e., path 48 bypassing the bridge) or (ii) to the hub through the bridge (when the consumer product is in host mode, i.e., path 54). Pet. 59–66; *see also* Pet. 11–13, 32–39. Petitioner contends alternative modifications of Chang to include a Mux as a routing logic circuit, as well as Chang II's detection circuit, reproduced below, would have been obvious:



The figures above show Petitioner’s annotations and proposed modifications of Figure 3 of Chang with Chang II’s detecting unit and a multiplexer as known in the art. Pet. 58. Petitioner contends each of these alternative Mux implementations renders this step obvious. Pet. 59. According to Petitioner, in these modifications, Chang’s bridge 52 and hub control unit 46/ hub 40 correspond respectively to the claimed USB bridge and USB hub. Pet. 60–61 (citing Ex. 1014 ¶¶ 19, 20; Ex. 1013 ¶¶ 234–237). Further, Petitioner asserts that, in this obvious modification, the “routing logic circuit” is a

multiplexer “connected directly to a USB bridge” steering the USB product signals to the bridge to achieve Chang’s host-to-host communication or the multiplexer bypassing the bridge and providing the signals directly to the hub to achieve Chang’s host-to-device communication. *Id.* at 61–62 (citing Ex. 1013 ¶ 238).

Further, Petitioner argues that connecting a USB product in host mode (“detection unit 134” automatically detecting the type of device connected (host or slave)” and a multiplexer “switch[ing] to the proper transmission path”), would have been obvious in view of Chang II and a POSITA’s knowledge. *Id.* at 62–64 (citing Ex. 1013 ¶¶ 238–245; Ex. 1015 ¶¶ 21, 38–44). Additionally, Petitioner contends Chang II’s control chip 13 corresponds to the claimed bridge controller and Chang II’s buffer unit 136 (shown in Figure 5) corresponds to the claimed buffer(s). Pet. 64–66 (citing Ex. 1013 ¶¶ 247–252; Ex. 1015 ¶¶ 21, 23). Petitioner argues Chang and Chang II disclose or render obvious that the bridge includes the claimed plurality of ports. Pet. 66.

Petitioner further contends that mux operation to route USB signals is straightforward and well within a POSITA’s knowledge and skillset. Pet. Reply 15–17.

b. Patent Owner’s Contentions

Patent Owner argues the proposed combinations are incomplete and technically unsound because the Petition fails to show the claimed method or routing logic circuit with particularity for any challenged claim. PO Resp. 18–22. Patent Owner argues the multiplexers that are relied upon to meet the claimed routing logic circuit are absent from Chang and Chang II and off-the-shelf switching components would not route detected signals in

the claimed manner. PO Resp. 19. Patent Owner contends the Petition is incomplete, inconsistent, and erroneous about how control signals for a multiplexer would be supplied or implemented in the proposed combinations. PO Resp. 20–22. More particularly, Patent Owner argues that “the Petition fails to set forth how the detection unit of Chang II would be utilized by the multiplexer in the proposed combination to route the USB ports in the specific manner recited by claim 1.” *Id.* at 22. According to Patent Owner, “while the POSITA's knowledge may include multiplexer components, it does not include the specific knowledge of how to use such generic switching components to modify Chang and Chang II to meet the specific routing requirements of the claims.” *Id.* (citing Ex. 2019 ¶ 78).

Patent Owner further argues that the proposed combinations are incomplete and technically unsound because the routing logic circuit would disconnect its control signals. PO Resp. 18, 22–31. Patent Owner contends the proposed combinations rely on Chang II's bridge device 1 and detection unit 134 to provide the control signals that cause the multiplexer to route the downstream ports through the appropriate transmission path and the detection unit is part of the control chip 13 of bridge device 1. PO Resp. 21, 23–24. Patent Owner argues that the proposed combination is structurally flawed. *Id.* That is, because the detection unit is part of the bridge, “in order to satisfy the ‘bypassing the USB bridge’ limitation of the claims, the detection circuit in the proposed combination must be *bypassed* when the USB signals are routed to the USB hub, when the consumer device is in the USB device mode.” PO Resp. 25.⁵ Patent Owner further argues when the

⁵ For convenience, this line of argument is referred to hereinafter as the “Dead-End Argument”.

bridge device is bypassed by the multiplexer, it is electrically disconnected from the downstream USB ports coupled to the multiplexer and is rendered incapable of detecting whether a device is in host or device mode.⁶

PO Resp. 28.

Patent Owner additionally argues the proposed combinations do not meet the claim limitations of independent claims 1, 5, and 10 because the combined teachings of Chang and Chang II would “reach[] a state in which the multiplexer routes the downstream consumer device directly to the USB hub, disconnecting the detection unit that generates the control signals; and rendering it unable to make or respond to such determination as required by the claims.” PO Resp. 32–33. Patent Owner contends that to the extent the Petition proposes relocating Chang II’s detection unit 134 to access the downstream USB ports — e.g., proximate to or integrated with the multiplexer, this would fail to meet claim 1 because it would fail to meet the claim requirement of bypassing the USB bridge for the reason that Chang II’s detection unit is part of the bridge and thus providing USB signals to the detection unit would not bypass the bridge.⁷ PO Resp. 33.

Patent Owner additionally argues “the proposed combination is improper because it relies on generically alleged common knowledge, rather than reasoned analysis and evidentiary support, to supply a claim limitation that is missing from the prior art references.” PO Resp. 37. Patent Owner further argues that “the Petition relies on conclusory statements and unspecific expert testimony to establish that the specific method steps or

⁶ *Id.*

⁷ *Id.* (Restatement of Dead-End Argument).

routing logic circuit required by the claims was part of the POSITA's general knowledge." PO Resp. 38.

c. Our Review

We are persuaded that Petitioner has shown by a preponderance of the evidence that the combined teachings of Chang with Chang II satisfy step 1d. As set forth above, in its contentions for this limitation, Petitioner proposes to modify Chang's hub to incorporate a switch (e.g., multiplexer) to perform the claimed function of "routing logic circuit. Pet. 59. Although neither Chang nor Chang II discloses using a multiplexer as a routing switch, Petitioner nonetheless establishes that, because a POSITA would have readily appreciated that the switching structure disclosed in Chang II is of the type that is well-known to be performed by a multiplexer. *Id.* at 61–63. Therefore, modifying Chang's hub as suggested would be within the purview of the ordinarily-skilled artisan. *Id.* More particularly, Petitioner offers expert testimony to support that using a multiplexer as a switching structure (e.g., multiplexers crossbars, crosspoint) was well known to the POSITA before 2013 for the specific purpose of routing USB communications emanating from a product to the appropriate path upon detecting the host/device mode of a product. *Id.* at 11–13 (citing Ex. 1013 ¶¶ 88–96; Ex. 1017 ¶¶ 56–57; Ex. 1040, 4:39–5:29; Ex. 1041, 1:20–36; Ex. 1055, 284–88; Ex. 1052, 3:7–20; Ex. 1053 ¶¶ 31–34; Ex. 1059; Ex. 1060; Ex. 1063; Ex. 1068).

We agree with Petitioner, Pet. Reply 15–17, that mux operation to route USB signals is straightforward and well within the POSITA's knowledge and skillset because Petitioner has provided reasoned analysis and evidentiary support. *See, e.g.*, Ex. 1013 § VI.B.2 (¶¶ 88–96) (describing

routing switch technology including datasheets for commercial USB routing switches); Ex. 1060 (Fairchild Semiconductor USB switch/multiplexer); Ex. 1061 (listing of USB switches); Ex. 1068 (Fairchild Semiconductor USB switch); Ex. 1071 (Fairchild Semiconductor USB switch). Accordingly, we are not persuaded by Patent Owner’s arguments that the Petition fails to show the claimed method or routing logic circuit with particularity for any challenged claim or relies on generically alleged common knowledge, rather than reasoned analysis and evidentiary support.

Further, we disagree with Patent Owner’s Dead-End Argument and related arguments for the reasons set forth below. As correctly noted by Petitioner, Patent Owner’s argument that the detection unit is disconnected from the downstream ports is untenable.⁸ As set forth above, in its contentions for this limitation, Petitioner proposes to modify Chang’s hub to incorporate Chang II’s teaching of a structure for switching (e.g., control chip) between the transmission paths associated with a selected communication type (host-to-host or host-to-device) identified by Chang II’s detecting unit. Pet. 59–61. As persuasively argued by Petitioner, corroborated by Petitioner’s expert declarant, and acknowledged by Patent Owner, the detection unit disclosed in Chang II must be connected to downstream ports to determine whether the detected unit is operating as a device or as a host. *Id.*, See PO Resp. 1 (“As Petitioner’s expert, Mr. Welch, cautions: ‘the detection unit *must connect* to the downstream port to detect

⁸ Petitioner contends that “[t]he P[atent] O[wner] R[esponse] manufactures a purported ‘structural flaw’ only by misstating the operation of Petitioner’s proposed combination.” Paper 36, 1.

the mode, as shown in Chang II.” (citing Ex. 1013 ¶ 193 (emphasis added by Patent Owner)); *see also id.* at 26, 52 (same quote from Welch repeated).

Patent Owner contrives this misleading line of argument by surmising that because, in Chang II, detection unit 134 of control chip 13 is located in bridge 1, in Petitioner’s combination, Chang II’s detection unit 134 must be likewise located in Chang’s bridge 52. *See* PO Resp. 23–24. Therefore, this argument is premised upon a presumed substitution of Chang II’s bridge device 1 (including detection unit 134 contained in control chip 13) for Chang’s bridge 52 to provide the mode detection signals. *Id.* (“[T]he proposed combination relies on Chang II’s bridge device 1 and detection unit 134 to provide the control signals that cause the multiplexer to route the downstream ports through the appropriate transmission path.”). However, Patent Owner’s argument improperly overlooks or misapprehends Chang II’s explicit teachings that detection unit 134 is directly connected to the downstream port. *See* Ex. 1015, Fig. 5 (reproduced below).

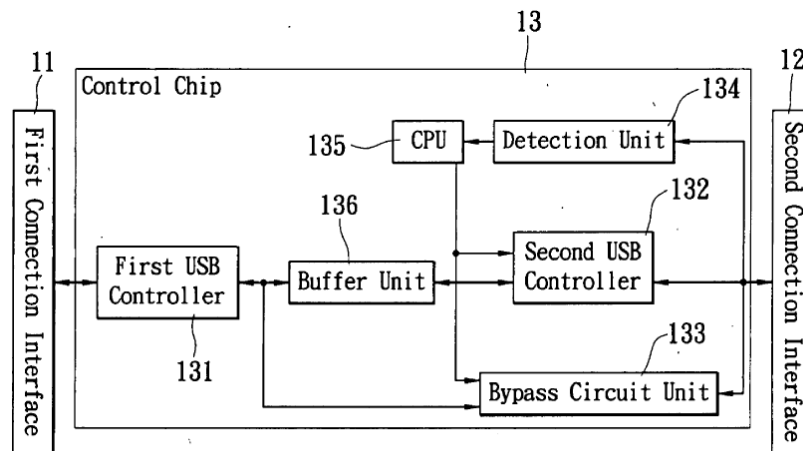


FIG. 5

Figure 5 depicts detection unit 134 directly connected to second connection interface 12. The detailed description of Figure 5 provides: “Detection unit 134 is also connected to the second connection interface 12, and the

detection unit 134 will automatically operate to switch between a virtual host state and a virtual slave state, wherein the states are used to determine the type of device currently connected with the second connection interface 12, and a detection signal (bridge detection signal or slave detection signal) is produced accordingly.” *Id.* ¶ 38. We determine that the combination, as proposed by Petitioner, is directed to *supplementing* Chang’s Hub 46 or Hub 40 with Chang II’s detection unit 134 (which may be internal/external to the Hub as depicted in annotated Fig. 3 of Chang above) to provide detected mode signals to a known multiplexer configured to select a suitable path (directly to the USB hub/bypassing the bridge when a host to device mode is detected or via the bridge when a host-to-host mode is detected). Pet. 46–48, 62–64. Therefore, Petitioner’s proposed combination of Chang with Chang II is no more than a simple arrangement of old elements with each performing the same function it had been known to perform, yielding no more than what one would expect from such an arrangement. *KSR*, 550 U.S. at 416. Accordingly, we disagree with Patent Owner’s argument that the proposed combination is incomplete and technically unsound because the routing logic circuit would disconnect its control signals. Patent Owner’s arguments addressing “to the extent the Petition proposes that Chang II’s detection unit 134 could be relocated to access the downstream USB ports,” PO Resp. 33, are addressed in connection with step 1e below.

After considering the entire record before us, we find that Petitioner has shown by a preponderance of the evidence that the combination of Chang with Chang II teaches the limitations in step 1d.

6. Step 1e Routing . . . in a USB Device Mode

Independent claim 1 recites:

routing the USB signals emanating from the consumer USB device to the first USB port via the routing logic connected directly to the USB hub and thereby bypassing the USB bridge in accordance with a determination by the signal detection circuit that the consumer device is operating in a USB device mode, wherein the USB hub and USB bridge have different components and functionality.

Ex. 1011, 9:31–39.

Petitioner argues that each of the Mux implementations described above renders this step obvious. Pet. 66–69. In particular, Petitioner argues (similar to that discussed above in connection with step 1d) it would have been obvious to modify Chang’s hub with Chang II’s controller including a detector and a switching structure (e.g., a multiplexer as is well-known in the art by a POSITA) to teach step 1e. *Id.* With respect to the language “wherein the USB hub and USB bridge have different components and functionality,” Petitioner contends that the hub and bridge are discrete components that perform (at a high level) different functions according to the ’643 specification. Pet. 68–69. Petitioner argues Chang’s hub unit 46 is a separate/discrete component from bridge 52 and similarly, in the Chang (Hub 40) mapping, the bridge is external to hub 40 and both the bridge and hub are discrete components. *Id.* at 69. Petitioner further contends in both Mux implementations the hub’s function is to connect the upstream host to multiple downstream products and the bridge provides a bridging function between two hosts (which occurs outside the hub). *Id.*

We discuss Patent Owner’s arguments, and our review and conclusions regarding Patent Owner’s arguments, above in connection with

step 1d. Further, as discussed in connection with step 1d above, we are persuaded that Petitioner's proposed combination of Chang with Chang II, and POSITA's knowledge, is no more than a simple arrangement of old elements with each performing the same function it had been known to perform, yielding no more than what one would expect from such an arrangement. *KSR*, 550 U.S. at 416.

Patent Owner contends, to the extent the Petition proposes that Chang II's detection unit 134 could be relocated to access the downstream USB ports, such an arrangement would fail to meet claim 1 because it would not meet the claim requirement of bypassing the USB bridge. PO Resp. 33. According to Patent Owner, Chang II's detection unit is part of the bridge such that there is no way for the proposed combination to satisfy the bypassing limitation while allowing the detection unit access to the downstream USB ports. *Id.*

We agree with Petitioner that Patent Owner's argument in this regard improperly assumes that Petitioner bodily incorporated Chang II's detection unit into the bridge in Chang's Hub module. Pet. Reply 18–19. As discussed above, the proposed modification is intended to supplement Chang's Hub 46 or Hub 40 with Chang II's detection unit 134 to provide detected mode signals to a known multiplexer configured to select a suitable path. Pet. 67–68. That is, by adding Chang II's detection unit to Chang's Hub to perform mode detection of a device connected to a downstream USB port of the Hub. *Id.* Thus, Chang's bridge can be bypassed upon the multiplexer receiving from the detection unit a detection signal that the device is operating in the device mode. *Id.*

“The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). “The obviousness analysis cannot be confined by [the] formalistic conception of the words teaching, suggestion, and motivation, or by overemphasis on the importance of . . . the explicit content of issued patents.” *KSR*, 550 U.S. at 419.

After considering the entire record before us, we find that Petitioner has shown by a preponderance of the evidence that the combination of Chang with Chang II teaches the limitations in step 1e. Accordingly, we determine that Petitioner has shown by a preponderance of evidence that Chang with Chang II, and POSITA’s knowledge, are properly combined and supported with sufficient motivation with a reasonable expectation of success (discussed below) to teach the limitations in step 1e. *KSR*, 550 U.S. at 417–18.

7. Motivation to Combine/Expectation of Success

a. Petitioner’s Contentions

Petitioner argues:

Chang discloses a hub with dedicated downstream device ports (for host-device connections) and a dedicated downstream host port (for a host-host connection through a bridge). It would have been obvious to modify Chang in view of Chang II and a POSITA’s knowledge to include one or more dual-role ports along with a switch and detection circuit to route the port(s) to the appropriate transmission path.

Pet. 42 (citing Ex. 1013 ¶¶ 175–202).

Petitioner argues “[a]s the ’643 patent admits, consumer products like smartphones with dual-role USB capabilities were gaining popularity before the 2013 priority date . . . a POSITA would have been motivated to combine Chang’s dedicated device- and host-ports to create one or more dual-role ports.” *Id.* at 42–43 (citing Ex. 1011, 2:42–3:7; Ex. 1013 ¶¶ 176, 177).

Petitioner further argues that common sense would dictate such a modification as “it would be impractical, and inconvenient at best, to require consumers to understand when to switch connections between dedicated host- and device-ports when using a dual-role product.” *Id.* at 42 (citing Ex. 1013 ¶ 177). Petitioner additionally argues that modifying Chang to include dual-role ports would further Chang’s express goal of “easily establishing a connection between a computer and another computer.” *Id.* at 43 (citing Ex. 1014 ¶ 3). According to Petitioner, a POSITA would have had a high expectation of success in modifying Chang to include the dual-role ports because dual host ports and host/device detection were already well-known using commercially available components and well-understood signaling. *Id.* at 44 (citing Ex. 1011, 3:22–60; Ex. 1025, 3:10–32, 3:40–4:8, 7:34–40; Ex. 1029, 27:26–28; Ex. 1052, 3:21–50). Further Petitioner argues that, “it was already well-known to include switching functionality, *e.g.*, using mux(es), to select the appropriate transmission path depending on the consumer product operating mode, *e.g.*, ‘host-to-host transmission path 54’ or ‘transmission paths 48.’” *Id.* at 44–45 (citing Ex. 1017 ¶ 57; Ex. 1052, 3:7–20; Ex. 1053 ¶¶ 31–34).

Furthermore, Petitioner argues “a POSITA would have recognized Chang effectively provides a roadmap to implement the necessary switching to support dual-role ports” because Chang describes a transmission path 54

for host-to-host connection and a transmission path 48 for host-to-device connection. *Id.* at 44–46. Accordingly, Petitioner states:

in the context of Chang, a POSITA would have been motivated to implement dual-role ports by including a switch (*e.g.*, multiplexer) to connect a dual-role port directly to the hub’s upstream port (when the consumer product is in device mode, *i.e.*, path 48) or to the hub through the bridge (when the consumer product is in host mode, *i.e.*, path 54). Welch, ¶184.

A POSITA would have been further motivated to improve Chang in view of Chang II, because Chang II expressly states its relevance to USB hubs. *See* EX1015, [0027] (invention performs “similar[ly] to the commonly known USB HUB function” for host-to-device communication); *see also id.*, [0040] (“the control chip 13 at this time ***functions like a USB Hub chip***, merely acting with intermediate transmission function”) (emphasis added); Welch, ¶181.

Id. at 45–46.

In Petitioner’s Reply to Patent Owner’s Response, Petitioner argues Patent Owner’s Dead-End Argument (described above) fails because it relies on a false premise that host/device detection takes place in the bridge using USB signals from the multiplexer. Pet. Reply 7–15.

b. Patent Owner’s Contentions

Patent Owner argues that the proposed combination is improper because it relies on conclusory statements and unspecific expert testimony to establish the missing limitation. PO Resp. 37–39. In particular, Patent Owner asserts that Petitioner relies on POSITA’s general knowledge (*e.g.*, conventional multiplexer components, generic descriptions of switching in Chang II) to teach the claimed routing logic circuit. *Id.*

Further, Patent Owner argues a POSITA would not have been motivated to modify Chang in view of Chang II and the POSITA’s

knowledge to meet the claimed routing control logic and detection circuit. PO Resp. 39–48; *see also* PO Sur-Reply 22–26. Patent Owner contends Petitioner’s combinations rely on hindsight reconstruction because the ’643 patent was provided to Mr. Welch before he was given the prior art. *Id.* at 39–40 (citing Exhibit 2021).

Patent Owner makes two additional arguments as to why a POSITA would not have been motivated to modify Chang in view of Chang II and the POSITA’s knowledge to meet the claim limitations. *Id.* at 39–48. First, Patent Owner argues the proposed combination would change the principles under which the prior art was designed to operate and would render the prior art inoperable for its intended purposes. PO Resp. 40–42; PO Sur-Reply 19–20 (arguing Patent Owner Response demonstrated how application of the references would result in inoperability). Patent Owner argues the Petition’s proposed combination would be unable to automatically detect the type of device once the hub module has been placed into device mode, and to switch to the appropriate transmission path accordingly. *Id.*

In more detail, Patent Owner contends the proposed combinations rely on Chang II’s bridge device 1 and detection unit 134 to provide the control signals that cause the multiplexer to route the downstream ports through the appropriate transmission path and the detection unit is part of the control chip 13 of bridge device 1. PO Resp. 23–24.⁹ Patent Owner argues that “the detection unit is part of the control chip 13 of bridge device 1.” PO Resp. 24; *see also* PO Resp. 25; PO Sur-Reply 3–9.

⁹ Page 41 of the Patent Owner Response refers to subject matter “described above.” We understand the material “described above” to be that on pages 22–31 of the Response.

Patent Owner contends that “in order to satisfy the ‘bypassing the USB bridge’ limitation of the claims, the detection circuit in the proposed combination must be *bypassed* when the USB signals are routed to the USB hub, when the consumer device is in the USB device mode.” PO Resp. 25. Patent Owner argues when the bridge device is bypassed by the multiplexer, it is electrically disconnected from the downstream USB ports coupled to the multiplexer and is rendered incapable of detecting whether a device is in host or device mode. PO Resp. 28. According to Patent Owner, the proposed combination would thus render Chang II inoperable for its admitted main feature and intended purpose. PO Resp. 42; PO Sur-Reply 19–20 (arguing Patent Owner Response demonstrated how application of the references would result in inoperability). Patent Owner contends the proposed combination would impair usability and functionality and undermine USB goals, for the same reasons. PO Resp. 42–44. Patent Owner contends a POSITA would not have any reasonable expectation of success in combining the references, for the same reasons. PO Resp. 48.

Second, Patent Owner argues the proposed combination would introduce unnecessary complexity, redundancy, and additional costs and no POSITA would be motivated to combine the prior art in a manner that introduces such costs and complexity unnecessarily. PO Resp. 44–48. Patent Owner contends the Petition modifies Chang’s USB hub by replacing its ports with new dual-role ports, and applies the bridge device of Chang II to the existing bridge device of Chang. PO Resp. 44. Patent Owner contends neither the bypass circuit unit 133 of Chang II, nor the existing switching circuitry connecting to the bypass circuit unit is utilized in Petitioner’s combinations. PO Resp. 45. Patent Owner further contends the

proposed combinations, at least in some implementations, introduce additional ports to Chang's USB hub and extends the circuitry outside Chang's existing hub enclosure 40. PO Resp. 46–47.

c. Our Review

We are persuaded that Petitioner has presented, by a preponderance of the evidence, a sufficient rationale to combine the teachings of Chang with Chang II, and POSITA's knowledge with a reasonable expectation of success. We are persuaded that the proposed combination of Chang and Chang II, which is supported by the testimony of Mr. Welch, pertains to known elements performing their ordinary functions to predictably result in a USB hub module with dual-role port functionality using a multiplexer to automatically switch between a host-to-host mode or host-to-device mode via a different transmission path depending on whether a detected connecting device is operating as a host or as a device. *KSR*, 550 U.S. at 416.

We find the order in which the materials were provided to Mr. Welch for evaluation is not evidence of hindsight. *See* Pet. Reply 21. Mr. Welch's process of first focusing on the patent and the claims and then looking at the prior art was quite reasonable and logical. Further, we agree with Petitioner that Patent Owner's Dead-End Argument is not persuasive because, as discussed above, Patent Owner relies on a false premise that host/device detection takes place in the bridge using USB signals from the multiplexer. *See* Pet. Reply 7–10. Patent Owner's premise is false because the Chang (Hub 46) and Chang (Hub 40) in Petitioner's proposed combinations of prior art (discussed and reproduced above in connection with step 1d) show the detection unit outside of the bridge. Pet. 49. Further, the Petition expressly

describes “it was also known to locate the detection unit proximate to (*or integrated with*) the switch.” Pet. 49 n.14 (emphasis added); *see also* Ex. 1013 ¶ 193 (“[i]n another obvious example, [detection circuitry] could be separate and between the dual-role port 50 and mux. This location is obvious because it is the first place a signal from a downstream USB product arrives”).

To be sure, in Chang II, Detection Unit 134 is part of Control Chip 13, which is in turn part of Data Transmission Bridge Device 1. *See* Ex. 1015, ¶¶ 22, 34, Fig. 1, Fig. 5. Nevertheless, in Petitioner’s combinations described in the Petition, the detection unit may be outside of the bridge, as discussed above. Patent Owner argues that the mapping of the claimed bridge controller to Chang II indicates that the detection unit cannot be outside the bridge. PO Sur-Reply 5–9. However, this argument is improperly based on bodily incorporation of Chang II into Chang. “[T]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . [r]ather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1294 (Fed. Cir. 2015) (quoting *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)).

Although Patent Owner correctly argues that the proposed modification of Chang by adding thereto Chang II’s controller including the detection unit and the switching mechanism (e.g., a well-known multiplexer), would add components to Chang’s system, we do not agree with Patent Owner that such a modification would render Chang’s resulting system more complex. Instead, we agree with Petitioner that the proposed

modification of Chang would allow the resulting Chang system to be more practical, efficient, and convenient as it would automate the switching between the transmission paths to operate in one of the two modes depending on the detected connecting device. For these same reasons, we do not agree with Patent Owner that the proposed modification would change Chang’s principle of operation or intended purpose. Simply put, the proposed combination would enhance the operation of the dual port system already disclosed by Chang. Further, even if modifying Chang as proposed would have somewhat complicated Chang’s design, “precedent . . . does not require that the motivation be the *best* option, only that it be a *suitable* option from which the prior art did not teach away.” *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197–1198 (Fed. Cir. 2014) (emphasis in original).

We are persuaded that Petitioner’s proposed combination of Chang with Chang II, and POSITA’s knowledge is no more than a simple arrangement of old elements with each performing the same function it had been known to perform, yielding no more than what one would expect from such an arrangement. Accordingly, Petitioner has sufficiently established by a preponderance of evidence that a POSITA would have been motivated to make the proposed combinations.¹⁰

¹⁰ It has been held that where the claimed subject matter involves more than the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement, a holding of obviousness *must* be based on “an apparent reason to combine the known elements in the fashion claimed.” *KSR*, 550 U.S. at 417–18. That is, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *Id.* at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Such

8. Secondary Considerations

a. Patent Owner's Contentions

Patent Owner argues secondary considerations further support that the challenged claims are non-obvious. PO Resp. 49–70. Patent Owner argues there are numerous objective indicia of non-obviousness as to the patented approach to providing persistent downstream connectivity. PO Resp. 50–68. Patent Owner further argues there is a clear nexus between the persistent downstream connectivity claims and objective indicia. PO Resp. 68–70.

In more detail, Patent Owner submits evidence which Patent Owner contends is evidence of long-felt but unsolved needs in the form of district court trial testimony and exhibits. PO 50–55. Patent Owner contends “automakers laid out three requirements for any CarPlay solution: (1) a ‘single lane to the head unit,’ (2) ‘CarPlay enabled on all downstream ports,’ and [(3)] ‘persistent USB connections when CarPlay is activated.’” PO Resp. 50–51. Patent Owner argues Patent Owner’s “dual role hub provided a third solution which satisfied all three of the automakers’ requirements.” PO Resp. 50–51, 54. Patent Owner submits evidence which Patent Owner contends is evidence of failure of others/skepticism of skilled artisans. PO Resp. 55–60. Patent Owner argues “[d]espite these substantial advantages [of market share, sales, and number of engineers], Microchip was unable to provide the functionality automakers demanded. In particular,

reasoning can be based on interrelated teachings of multiple patents, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art. *Id.* at 417–18.

Microchip was not able to provide persistent downstream data connectivity for non-CarPlay ports.” PO Resp. 55.

Patent Owner submits evidence which Patent Owner contends is evidence of commercial success. PO Resp. 60–62. Patent Owner contends “[Patent Owner] won this business because its innovative solution permitted it to satisfy the three automaker requirements: (1) single upstream connection, (2) CarPlay on all ports, and (3) persistent downstream connectivity on non-CarPlay ports.” PO Resp. 62.

Patent Owner submits evidence which Patent Owner contends is evidence of industry praise including a PACE Award. PO Resp. 62–64. Patent Owner argues “[Patent Owner’s] dual-role hub received the PACE award because of its ability to allow persistent downstream USB connectivity to non-CarPlay devices while CarPlay was active without requiring an alteration to the head unit hardware to permit a second upstream connection.” PO Resp. 63.

Patent Owner submits evidence which Patent Owner contends is evidence of copying. PO Resp. 64–68. Patent Owner contends Petitioner studied Patent Owner’s design and Petitioner “introduced what it referred to as a ‘multi-host endpoint reflector,’ which—like Aptiv’s product—used a host-to-host USB bridge and multiplexing switches to provide CarPlay support using a single upstream connection while still providing persistent downstream data connectivity on the non-CarPlay ports.” PO Resp. 68.

In connection with nexus, Patent Owner argues “[t]he combination of a host-to-host USB bridge with specific routing logic allowed the dual role hub to provide CarPlay support on each downstream port without the need for a second upstream connection with the head unit and without interrupting

USB connectivity on the non-CarPlay downstream ports.” PO Resp. 69.

Patent Owner further argues:

Aptiv has established that the secondary considerations are the “direct result of the unique characteristics of the claimed invention”—specifically, the configuration of the USB bridge and routing logic circuit, which are directly tied to enabling the persistent downstream USB connectivity on all ports via a single upstream head unit connection that was desired by automakers.

PO Resp. 70.

Patent Owner further argues “Petitioner argues that nexus requires limiting claims to one upstream connection (Reply at 25), but objective indicia are relevant ‘so long as what was sold was within the scope of the claims.’ *In re DBC*, 545 F.3d 1373, 1384 (Fed. Cir. 2008).” PO Sur-Reply 29.

b. Petitioner’s Contentions

Petitioner argues that Patent Owner’s secondary considerations fail for two reasons. Pet. Reply 23–30. First, Petitioner argues that Patent Owner fails to establish nexus. *Id.* at 24–26. Second, Petitioner argues Patent Owner’s secondary considerations fail individually. *Id.* at 26–30.

c. Our Review

We have considered Patent Owner's evidence of secondary considerations.

i. Nexus.

Upon consideration, however, we conclude that in each category, Patent Owner's evidence is entitled to minimal weight because Patent Owner has not sufficiently shown a nexus between the evidence and the claimed invention. *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332

(Fed. Cir. 2019) (“to be accorded substantial weight in the obviousness analysis, the evidence of secondary considerations *must have a ‘nexus’ to the claims, i.e.,* there must be ‘a legally and factually sufficient connection’ between the evidence *and the patented invention*” (emphasis added)). This is because the features cited by Patent Owner are not claimed and thus are not part of the claimed and patented invention. For example, (1) CarPlay support on each downstream port without the need for a second upstream connection with the head unit and without interrupting USB connectivity on the non-CarPlay downstream ports and (2) persistent downstream USB connectivity on all ports via a single upstream head unit, as argued by Patent Owner on pages 69 and 70 of Patent Owner’s Response, are not claimed. Pet. Reply 24–26; Ex. 1011, 9:15–10:59.

We are not persuaded by Patent Owner’s arguments based on *DBC* for several reasons. First, in *DBC* the Federal Circuit affirmed the Board’s finding that secondary considerations were insufficient to overcome a strong *prima facie* case of obviousness. *DBC*, 545 F.3d at 1384–85. Second, the Patent Owner’s quote is taken out of context. *See id.* Patent Owner leaves out the language immediately prior to the quoted language. *Id.* The issue addressed by the Federal Circuit was whether the patentee must sell every conceivable embodiment of the claims in order to rely upon evidence of commercial success. *Id.* The full sentence in *DBC* is: “[the patentee] need not sell every conceivable embodiment of the claims in order to rely upon evidence of commercial success, so long as what was sold was within the scope of the claims.” *Id.* Third, *DBC* reiterates the importance of the evidence matching *the claimed invention*. *Id.* The Federal Circuit explained “the proponent [of commercial success] must offer proof ‘that the sales were

a direct result of the unique characteristics *of the claimed invention*—as opposed to other economic and commercial factors unrelated to the quality *of the patented subject matter.*” *Id.* at 1384 (quoting *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996)) (emphasis added). The Federal Circuit further explained “[f]or objective evidence to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of *the claimed invention.*” *Id.* (quoting *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed.Cir.1995)) (emphasis added). Finally, the holding in *DBC* was that “[h]owever substantial those sales, that evidence does not reveal in any way that the driving force behind those sales was *the claimed combination.*” *Id.* (emphasis added).

Patent Owner cites to testimony but, in the Response, fails to identify the witness or the proceeding in which the testimony was given. PO Resp. 51, 56–61. However, the cited testimony does not identify any particular witness discussing Patent Owner’s “commercial ‘dual-role hub’ containing its Boston-2 chip.” *Id.* Nor do we find any testimony that any of Patent Owner’s products included a “host-to-host USB bridge,” “a USB routing switch,” or “the specific arrangement claimed in the [’643] patent.” *Id.*

The only other evidence cited by Patent Owner in support of its nexus contention is a single paragraph from the Supplemental Declaration of Dr. Houh. *See* PO Resp. 70 (citing Ex. 2019 ¶ 156). Patent Owner contends that the cited paragraph “provides on a per-limitation basis how [Patent Owner]’s Dual Role Hub meets all limitations of claim 1.” *Id.* However, the cited paragraph is limited to providing an analysis of only claim 1 of the ’643 patent. *See* Ex. 2019, 156 (containing first sentence of ¶ 156 that

states, “I provide an analysis of how [Patent Owner]’s dual role hub embodies each limitation of Claim 1 of the ’643 Patent.” Because Patent Owner fails to provide sufficient, persuasive evidence that “the secondary considerations are the ‘direct result of the unique characteristics of the claimed invention,’” we reject Patent Owner’s contention that it is entitled to a presumption of nexus or has shown a nexus between its secondary considerations evidence and the claimed invention.

ii. Long-Felt Need

In response to Patent Owner’s argument that there existed “long-felt but unsolved needs,” Petitioner asserts that Patent Owner ties the alleged need to Apple CarPlay that “was not announced until 2013 . . . mere months before the ’643 patent’s priority date” and “[t]hat is the opposite of long-felt need.” Pet. Reply 26. We find that Patent Owner fails to establish that there existed a long felt but unsatisfied need for the invention claimed in the ’643 patent. Patent Owner not only fails to show that there was any need that was long felt but Patent Owner also fails to show that the alleged need was for the claimed invention. *See* PO Resp. 50–55.

iii. Skepticism of Others

Patent Owner argues “[f]ailure of others/skepticism of skilled artisans.” PO Resp. 55–60. Patent Owner presents evidence that, in 2014, Petitioner’s employees expressed doubt that a USB system could accommodate more than one USB host and were skeptical that Patent Owner had found a way to accommodate attaching a second host (such as an Apple phone) to a USB system. *See id.* Petitioner blames Apple for telling Petitioner that “Apple would not allow a bridge” and telling Patent Owner “that using a bridge was likely ‘fine.’” Pet Reply 28. Although Patent

Owner's evidence is weak with regard to the relationship between the alleged failure and skepticism and the claimed invention, we give some weight to Patent Owner's argument and these secondary consideration factors in our overall consideration of obviousness. It does appear that Patent Owner succeeded where Petitioner for at least some time failed and Petitioner's employees were skeptical about Patent Owner's solution.

iv. Commercial Success

Patent Owner alleges commercial success. PO Resp. 60–62. Patent Owner presents evidence that it won business from the Big 3 (GM, Chrysler, and Ford) US auto manufacturers. *Id.* Patent Owner presents evidence that the Big 3 switched their business from Petitioner to Patent Owner in 2014. *Id.* at 61. With regard to later years, Patent Owner provides:

GM contracted [Patent Owner] as their sole source supplier of media module hubs in every mid- and high-level infotainment system globally for model year 2015. (EX2037, 13.) Altogether, [Patent Owner] captured 40% of the global Big 3 offerings for model year 2016, representing 10 million units. (*Id.*) Ultimately, [Patent Owner] sold approximately 45 million units between 2015 and November 2021. (EX2041, 281:12-22.)

Id. at 61. Patent Owner contends that “[t]his was an unquestionable commercial success for a new product launch in the automotive industry” and “[t]his sudden shift to an inexperienced chip manufacturer with a product not yet tested in the market was extraordinary.” *Id.*

Petitioner claims that Patent Owner has failed to show that any alleged commercial success was due to factors related to the claimed invention. Pet Reply 27–28. Petitioner argues:

P[atent] O[wner] ignores other factors affecting sales such as Apple’s brand name, lower pricing (EX2040, 233:4-12), marketing, etc. The impact of Apple’s certification and brand name (as perhaps the most recognized company on the planet) cannot be ignored.

Significantly, PO benefited from a head start due to early, insider access to Apple’s confidential CarPlay requirements through the Jaguar car company. *E.g.*, EX2003, 109:6-12, 157:6-15, 149:12-22 (CarPlay “not publicly known” and “Apple is pretty secret”), 108:13-109:10-12 (“Jaguar was talking to Apple...start[ed] feeding us some of these requirements.”).

Id. As discussed above, we determine that any alleged commercial success secondary consideration evidence has not been established to have a nexus to the claimed invention. Accordingly, we consider the evidence of commercial success but accord it little weight in our overall obviousness determination.

v. Industry Praise

Patent Owner also argues that it “achieved significant acclaim within the automobile industry for its dual role hub.” PO Resp. 62–63. Patent Owner argues, “[m]ost notably, it was the winner of the 2016 PACE Award, an industry honor awarded by Automotive News.” *Id.* at 62 (citing Ex. 2036 ¶ 4). For evidence as to this award, Patent Owner relies primarily on the Declaration of Michael Dreon (Ex. 2036). *See id.* at 62–63. In particular, Patent Owner relies on the Dreon Declaration in an attempt to show that the award was linked to the invention claimed in the ’643 patent. *Id.* at 63 (citing Ex. 2036 ¶ 9). The cited paragraph in the Dreon Declaration states: “Based on my conversations with the judges, as well as from the judge’s citation and award video, it is my understanding that the feature driving their

selection of the dual-role hub was its ability to allow persistent downstream USB connectivity to non-CarPlay devices while CarPlay was active without altering the head unit hardware to add a second upstream connection.” Ex. 2036 ¶ 9. As will be appreciated from this testimony, it is based on hearsay and the witness does not establish that he has any first-hand knowledge of the reason for the award. Petitioner argues:

P[atent] O[wner] cites a single “Automotive News” award (from a non-USB body) touting CarPlay compatibility. POR, 74-75. The dozen-plus “winners” included “Cover Carving Technology for seats” and “Electronic oil pump.” See www.autonews.com/awards/pace/2016/. P[atent] O[wner] self-nominated for the award (EX2036, ¶6) and hosted judges for “site tours” and “lunches” (EX2037, 2). P[atent] O[wner]’s declarant (Mr. Dreon) cites inadmissible hearsay based on purported “conversations with the judges” regarding why [Patent Owner] won. EX2036, ¶9. The PACE article mentions other reasons (*e.g.*, “lower cost”). www.autonews.com/awards/2016-winner-delphi-automotive-dual-role-hub. This is not “objective evidence” establishing nonobviousness.

Pet Reply 28. Petitioner’s criticism of this purported evidence of industry praise has merit. We accord this evidence of purported industry praise little weight.

vi. Copying

Patent Owner further alleges that Petitioner copied its product. PO Resp. 64–68. As evidence that Petitioner copied its product, Patent Owner argues that Petitioner “obtained one of [Patent Owner]’s chips from a competitor and analyzed it to understand its capabilities.” *Id.* at 67 (citing Ex. 2040, 186:22–188:12). Patent Owner claims that Petitioner introduced

its product “several years later.” *Id.* at 68. Petitioner presents evidence that Patent Owner has this timing wrong. Pet Reply 29. Petitioner argues:

Moreover, P[atent]O[wner]’s insinuation [Petitioner] copied [Patent Owner] because it “obtained...and analyzed [an [Patent Owner] product]” is baseless. POR, 79. The alleged activity was done in “July of 2016” as pre-suit investigation before suing [Patent Owner], *after* [Petitioner] “finished [its] device and [was] making it available [for customer testing].” EX2040, 125:9-126:16.

Id. Petitioner’s argument is supported by the cited evidence. Patent Owner’s purported evidence of alleged copying by Petitioner is entitled to little or no weight because it is not well-supported.

9. Conclusion Regarding Independent Claim 1

For the reasons discussed above, we conclude Petitioner has shown by a preponderance of the evidence that independent claim 1 would have been obvious over the combination of Chang, Chang II, and POSITA’s knowledge.

10. Independent Claims 5 and 10

Petitioner contends that independent claims 5 and 10 bear many similarities to independent claim 1 and both Mux implementations satisfy them for largely the same reasons as claim 1. Pet. 75–77, 79–82. Accordingly, Petitioner argues that independent claims 5 and 10 would have been likewise obvious over the combination of Chang, Chang II, and POSITA’s knowledge. *Id.*

Patent Owner indicates independent claims 5 and 10 are analogous to independent claim 1 and does not make separate, substantive arguments for independent claims 5 and 10. PO Resp. 31–33.

For the reasons discussed above, we conclude Petitioner has shown by a preponderance of the evidence that independent claims 5 and 10 would have been obvious over the combination of Chang, Chang II, and POSITA's knowledge.

11. Dependent Claims 2, 7, and 13

Each of dependent claims 2, 7, and 13 recites that the "USB host is embedded in an infotainment system." Ex. 1001, 9:39–40, 10:12–13, 53–54. Petitioner contends that dependent claims 2, 7, and 13 would have been obvious over the combination of Chang, Chang II, and POSITA's knowledge. Pet. 69–71, 78, 84. First, Petitioner argues the '643 patent admits there was a need for the vehicle infotainment system to connect to downstream hosts and Chang's host-to-host bridge addresses this specific need and therefore it would have been obvious to connect Chang's system to a vehicle infotainment system embedded host. Pet. 70. Second, Petitioner argues a POSITA would have recognized that Chang is applicable to any system employing a USB hub, and in particular, where a host-to-host connection would be advantageous. *Id.* Third, Petitioner additionally argues Chang provides an example of an upstream host PC (which is analogous to a vehicle infotainment system) connecting to a downstream port (which is analogous to a phone), expressly suggesting application to the vehicle environment (namely an embedded host in an infotainment system). *Id.* at 70–71.

Patent Owner argues the Petition's proposed combination fails to meet that the USB host is embedded in an infotainment system. PO Resp. 33. Patent Owner argues neither Chang nor Chang II discloses or relates to

infotainment systems, or to vehicles, and the Petition makes no attempt to show the proposed combinations would meet the particular data connection requirements of infotainment systems. PO Resp. 34. Patent Owner further argues a POSITA would have recognized that infotainment systems present unique difficulties for hubs with host-to-host functionality, for example, streaming capability. PO Resp. 34–36; *see also* PO Sur-Reply 26–27.

We agree with Petitioner’s first argument summarized above. *See, e.g.,* Ex. 1011, 1:52–62 (“[t]he USB Host function is often embedded into a component of the vehicle infotainment system”), 3:8–14. Further, we are not persuaded by Patent Owner’s arguments because particular data connection requirements of infotainment systems and functions such as streaming capability are not recited in dependent claims 2, 7, and 13 and accordingly Patent Owner’s arguments are not commensurate with the claims. *See* Pet. Reply 19–20.

For the reasons discussed above, we conclude Petitioner has shown by a preponderance of the evidence that dependent claims 2, 7, and 13 would have been obvious over the combination of Chang, Chang II, and POSITA’s knowledge.

12. Dependent Claims 3, 4, 6, 8, 9, 11, 12, 14, and 15

Petitioner contends that dependent claims 3, 4, 6, 8, 9, 11, 12, 14, and 15 would have been obvious over the combination of Chang, Chang II, and POSITA’s knowledge. Pet. 71–75, 77–79, 82–85. For claims 3, 8, and 14, Petitioner argues both Mux implementations of Ground 1 render this subject matter obvious for the reason that a USB routing switch (a mux in the Mux implementations) performs bypassing. Pet. 71–72, 78, 84. For claims 4, 9,

and 15, Petitioner argues both Mux implementations render obvious a switch and signal detection circuit and it would have been obvious to include these on a single IC. Pet. 72–75 (relying in part on Figure 5 of Chang II showing detection unit 134 and bypass circuit 133 on control chip 13), 78–79, 84–85.

Patent Owner argues “by bypassing the USB bridge as recited in the claim, the multiplexer disconnects the detection unit (part of the bridge), preventing it from providing the control signals that would perform the routing recited in claim 1.” PO Resp. 36–37; *see also* PO Sur-Reply 27.

We agree with Petitioner’s arguments in the Petition summarized above. Further, we are not persuaded by Patent Owner’s arguments because we disagree with Patent Owner’s Dead-End Argument and related arguments for the reasons set forth in Section II.F.5.c above regarding motivation to combine.

Patent Owner does not make separate arguments in connection with claims 6, 11, and 12. *See* PO Resp. 31–37. Further, we agree with Petitioner’s arguments regarding these claims. *See* Pet. 77–78, 82–84.

For the reasons discussed above, we conclude Petitioner has shown by a preponderance of the evidence that dependent claims 3, 4, 6, 8, 9, 11, 12, 14, and 15 would have been obvious over the combination of Chang, Chang II, and POSITA’s knowledge.

G. Obviousness over Chang in view of Chang II, and Chutorash (Ground 2)

Petitioner argues that dependent claims 2, 7, and 13 are obviousness over Chang in view of Chang II and Chutorash. Pet. 5, 85–88. Dependent claim 2 recites “the USB host is embedded in an infotainment system.” Ex. 1011, 9:40–41. Dependent claims 7 and 13 recite similar language.

Id. at 10:10–12, 10:51–53. Petitioner contends Chutorash discloses the subject matter in these dependent claims. Pet. 85–88.

Patent Owner argues “the proposed combination of Ground II suffers from the same defects discussed for Ground 1.” PO Resp. 49. Patent Owner does not contend that the subject matter recited in dependent claims 2, 7, and 13 is not disclosed, taught, or suggested by Chutorash. PO Resp. 48–49.

We agree with Petitioner that Chutorash discloses, teaches, or suggests the subject matter of dependent claims 2, 7, and 13. *See, e.g.*, Ex. 1029, 27:27–28, Fig. 27.

For the reasons discussed above, we conclude Petitioner has shown by a preponderance of the evidence that dependent claims 2, 7, and 13 would have been obvious over the combination of Chang, Chang II, and Chutorash.

H. Indefiniteness (Grounds 3 to 6)

Petitioner argues four different grounds based on indefiniteness. Pet. 88–102. Patent Owner argues the challenged claims are not indefinite. PO Resp. 70–86. We address each of these grounds in turn.

1. The USB Hub and USB Bridge Have Different Components and Functionality (Ground 3, Claims 1–15)

We will discuss the Parties’ arguments and then our analysis.

a. Parties’ Contentions

Petitioner argues the language “the USB hub and USB bridge have different components and functionality” in each of independent claims 1, 5, and 10 renders claims 1–15 indefinite and therefore invalid under § 112(b). Pet. 88–92. Petitioner argues the specification and file history provide no guidance on what the claimed difference(s) must be. *Id.* at 89, 91–92.

Petitioner further argues the claim language does not say the USB hub and USB bridge “are” different components, only that they “have” different components “[b]ut even if the limitation were read to refer to the ‘type’ of component, it still begs the question whether the limitation requires only the hub and the bridge have one different component or must have all different components (mutually exclusive sets).” *Id.* at 89–90. Petitioner further argues “[o]n the other hand, ‘have different components’ could mean the hub and bridge are made with different physical components.” *Id.* at 90.

Petitioner additionally argues that the “different . . . functionality” is even more indefinite because from one perspective the hub and bridge both function to connect ports but “drilling down on how the hub and bridge function to connect ports will result in some differences . . . at what level of detail does the claim require defining the ‘functionality’?” *Id.* at 90–91.

Patent Owner argues this language was added by the Examiner to place the claims in condition for allowance and is “non-technical, providing general descriptive language that means simply what it says . . . [and Petitioner’s arguments are] a complaint about the breadth of the claim.” PO Resp. 71–72. Patent Owner contends a POSITA would understand that any difference in components and functionality would satisfy the language. PO Resp. 73–74 (citing Supplemental Declaration of Dr. Houh (Ex. 2019)). Patent Owner further argues that a district court in related litigation held this claim language to be not indefinite. PO Resp. 71.

b. Our review

A patent claim is indefinite and therefore invalid under § 112(b) if, when “read in light of the specification delineating the patent, and the prosecution history, [the claim] fail[s] to inform, with reasonable certainty,

those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014).

The ’643 patent indicates that the USB hub is an integrated circuit including at least an upstream USB port coupled to a plurality of downstream USB ports via a USB digital logic for relaying signals between the host port and consumer ports within a vehicle. Ex. 1011, 2:33–41, 5:56–67, Fig. 4. The ’643 patent further indicates that the USB bridge is also an integrated circuit configured for controlling the switching device. *Id.* at 6:3–5. Specifically, when the consumer device is acting as a USB host, “the USB Bridge processes the USB packets from the consumer port and provides them to the USB Hub, thereby rendering the consumer device compatible with the vehicle's embedded USB Host.” *Id.* at 6:9–13. Whereas, when the consumer device is acting as a USB device, “the USB Bridge controls the switching device such that the switching device provides the USB signaling directly to the USB Hub, bypassing the Bridge.” *Id.* at 6:5–17.

We agree with Patent Owner’s arguments, particularly that the language means what it says. A POSITA, having read the ’643 patent, would understand that a USB hub and a USB bridge are different types of circuits that include different components and perform different functions within a USB hub module. The language “the USB hub and USB bridge have different components and functionality” was added by the Examiner¹¹ to reflect the distinct operations roles performed by these different components. Therefore, although the ’643 patent does not particularly

¹¹ Ex. 1012, 202–203.

enumerate the components included in the USB bridge, the POSITA would be able to ascertain the specifications of such a typical USB bridge from widely available sources. More particularly, as noted in the afore-cited portions of the '643 Patent, the POSITA would readily appreciate that the USB hub serves to relay packets between the different ports within the USB hub module, whereas the USB bridge serves to control host-to-host and host-to-device communications within the module.

We therefore conclude the cited terminology informs with *reasonable* certainty those skilled in the art about the scope of the invention. *Nautilus*, 572 U.S. at 901. For the reasons discussed above, we conclude Petitioner has not shown by a preponderance of the evidence that claims 1–15 are indefinite and therefore invalid under § 112(b).

2. Routing Logic Circuit (Ground 4, Claims 1–15)

We will discuss the Parties' arguments and then our analysis.

a. Parties' Contentions

Petitioner argues that the term “routing logic circuit” in each of independent claims 1, 5, and 10 is a coined term without a well-understood meaning. Pet. 92. Petitioner argues the functions recited in the claims for the routing logic circuit do not clarify the boundaries/structure of that circuit. Pet. 92–93. Petitioner additionally contends dependent claim 3¹² “only confuses the matter further by reciting ‘a USB routing switch’ performs the claimed routing” because it is unclear whether a “routing logic circuit” is the same as, or different than, a “USB routing switch.” *Id.* at 93. Petitioner

¹² Dependent claim 3 recites “wherein the bypassing the USB bridge is performed by a USB routing switch.” Ex. 1011, 9:42–43.

further argues the specification provides no clarity because the specification never uses the term “routing logic circuit” and nothing in the specification explains what circuit implements the logic. Petitioner concludes “[b]ecause the intrinsic evidence provides no objective boundaries for the coined term ‘routing logic circuit,’ it is indefinite.” *Id.* at 94.

Patent Owner argues the term “routing logic circuit” is not indefinite. PO Resp. 74–76. Patent Owner argues the claims recite functions performed by the routing logic circuit and thus identify the class of structures to which the term applies: circuits that route signals. *Id.* at 75. Patent Owner contends the specification discloses multiple configurations in which routing logic circuitry may be implemented, for example, a discrete device, inside a USB multiplexing switch, or it may include circuitry to implement USB routing logic. *Id.* Patent Owner argues this term was added by the Examiner in order to place the claims in position for allowance and thus is presumed to be definite. *Id.* at 76.¹³ Finally, Patent Owner argues the district court agreed with Patent Owner that a POSITA would understand that this term refers to a class of structures that directs signals from one input/output interface to another. PO Resp. 75.

b. Our review

The ’643 patent indicates that “[t]he USB Hub Module also includes a switching device (such as USB analog multiplexing switches for example) that is configured to route each consumer port to either the Bridge or the Hub.” Ex. 1011, 4:40–43. As depicted in Figure 4 of the ’643 patent, the switching device is directly coupled to the USB bridge and the USB hub to

¹³ Patent Owner cites the wrong Notice of Allowance. The correct Notice of Allowance is at pages 197–209 of Exhibit 1012.

route signals emanating from the consumer device to the USB bridge or the USB hub. *Id.* at 6:5–8. Therefore, a POSITA, having read the ’643 patent, would readily appreciate that the claimed “routing logic circuit” is directed to the switching device because the routing function of the switching device as described in the ’643 patent comports with the same functions of the “routing logic circuit” as recited in independent claims 1, 5, and 10. We conclude, when read in light of the specification and prosecution history, the terminology informs with *reasonable* certainty those skilled in the art about the scope of the invention. *Nautilus*, 572 U.S. at 901.

For the reasons discussed above, we conclude Petitioner has not shown by a preponderance of the evidence that claims 1–15 are indefinite and therefore invalid under § 112(b).

3. Detection Circuit (Ground 5, Claims 1–9)

We will discuss the Parties’ arguments and then our analysis.

a. Parties’ Contentions

Petitioner contends independent claims 1 and 5 both recite “a signal detection circuit” that receives USB signals from an attached consumer product and determines if the product is in host or device mode. Pet. 94. Petitioner argues the term “signal detection circuit” is a means-plus-function claim term under § 112(f) because it recites a nonce term—and no structure—to perform the functions of receiving signals and determining whether a connected USB product is in host or device mode. *Id.* Petitioner further argues in the term “signal detection circuit” both “signal detection” and “circuit” are used generically and do not connote structure but instead indicate some type of detection function. *Id.* at 96–97. Petitioner

additionally argues “the ’643 patent fails to disclose *any structure whatsoever* for determining host/device status, much less link that structure to the ‘signal detection circuit.’” *Id.* at 98. Petitioner argues that because the ’643 specification fails to describe any corresponding structure, claims 1 and 5 (and their dependent claims) are indefinite. Pet. 94.¹⁴

Patent Owner contends that because “signal detection circuit” does not recite the word “means,” it is presumed that § 112(f)¹⁵ does not apply. PO Resp. 77. Patent Owner argues the term “circuit” is well-understood by a POSITA as conveying structure. *Id.* at 77–78 (citing Ex. 2001 ¶¶ 104–105, 107; Ex. 2019 ¶¶ 129–132¹⁶). Patent Owner additionally argues that courts have repeatedly held that “circuit” connotes structure and such connotation is consistent with general-reference texts and prior art patents in the field. PO Resp. 78–79 (citing, *e.g.*, *The Wiley Electrical and Electronics Engineering Dictionary* (Ex. 2015)).

Patent Owner further argues Petitioner cannot overcome the presumption that “signal detection circuit” is not a means-plus-function term. PO Resp. 79–82. According to Patent Owner, this is because the term “signal detection circuit” is well-understood by a POSITA as conveying sufficient structure and the adjectival qualifier “signal detection” before “circuit” in claim 1 indicates that the circuit operates to detect signals and

¹⁴ Petitioner states for purposes of prior art analysis the Petition considers “signal detection circuit” to be any circuit that performs the claimed functions. Pet. 99.

¹⁵ Patent Owner refers to the pre-AIA § 112 ¶ 6 instead of the AIA § 112(f). For consistency and correctness, we refer to § 112(f).

¹⁶ Paragraphs 129–132 are a typographical error—the correct paragraphs are 133–138.

adds further structure by describing the operation of the “circuit.”

PO Resp. 79–80. Patent Owner additionally argues surrounding claim language further describes the signal detection circuit’s operation, which provides sufficient detail to connote structure to a POSITA such that the term should not be deemed a means-plus-function limitation. PO Resp. 81–82.

b. Our review

We conclude that “signal detection circuit” is not a nonce term for several reasons. First, we find the term “circuit” is well-understood by a POSITA as conveying structure. *See, e.g.*, Ex. 2001 (Houh Decl.) ¶¶ 104–105, 107; Ex. 2012, codes (54), (57), 7:40–8:63; Ex. 2015 (Wiley Dictionary), 4. Second, courts have repeatedly held that “circuit” connotes structure. *See, e.g., Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 711 F.3d 1348, 1364 (Fed. Cir. 2013) (“We have previously held on several occasions that the term ‘circuit’ connotes structure”). Third, the qualifier “signal detection” before “circuit” indicates that the circuit operates to detect signals and adds further definition to the circuit structure by describing and defining the operation of the “circuit.” Ex. 1011, 9:15–39, 9:46–10:3. Finally, additional claim language further describes the signal detection circuit’s operation, context, and role in the claim as a whole, including determining whether the consumer device is operating in a USB host mode (claim 1) or whether the second USB signals emanate from a second USB host (claim 5), which provides additional definition of the required circuit structure to a POSITA. *Id.*

Because “signal detection circuit” does not use the term “means” or a nonce term, § 112(f) is not applicable to “signal detection circuit.” Because

Petitioner’s indefiniteness argument is premised on applicability of § 112(f) to “signal detection circuit” (Pet. 94, 97), Petitioner has not established that “signal detection circuit” is indefinite.

For the reasons discussed above, we conclude Petitioner has not shown by a preponderance of the evidence that claims 1–9 are indefinite and therefore invalid under § 112(b).

*4. The USB Routing Switch Includes the Signal Detection Circuit
(Ground 6, Claims 4, 9, and 15)*

We will discuss the Parties’ arguments and then our analysis.

a. Parties’ Contentions

Petitioner states dependent claims 4 and 9 recite “wherein the USB routing switch includes the signal detection circuit” and dependent claim 15 similarly recites “the USB routing switch determines whether the second USB signal emanates from a USB device.” Pet. 99. Petitioner contends “[c]laim 15 would be understood to require that the switch includes the signal detection circuit.” *Id.* Petitioner argues “[t]he claim language, specification, and file history do not provide reasonable clarity on what it means for the ‘routing switch’ to include ‘the signal detection circuit’” and that claims 4, 9, and 15 are indefinite. *Id.* Petitioner argues the claim language (namely, “includes”) indicates that the “signal detection circuit” is inside the “switch” or that the “switch” uses the same circuitry as the “signal detection circuit” and that this makes little sense to a POSITA, because the “switch” and “signal detection circuit” would be understood to be two separate, physical collection of transistors. *Id.* at 99–100. Further, Petitioner argues claim 15 is nonsensical because it refers to the “routing switch” performing the function of “determin[ing] whether the second USB

signal emanates from a USB device” because a detection circuit performs this function, not a switch. *Id.* at 100–101. Petitioner concludes “how ‘the switch includes the signal detection circuit’ is not reasonably certain to a POSITA and the specification and file history fail to provide the requisite clarity.” *Id.* at 102.

Patent Owner argues the word “includes” itself has a straightforward, plain meaning and based on its plain meaning, a POSITA would understand the claim language requires simply that the USB routing switch comprises the signal detection circuit as part of a whole or group. PO Resp. 83–84 (citing Merriam-Webster Online Dictionary (Ex. 2011)). Patent Owner argues the surrounding claim language and prosecution history confirm this meaning. PO Resp. 84. Further, Patent Owner argues Petitioner’s contentions relate to implementation-level details, which do not give rise to indefiniteness. *Id.* at 85–86. Additionally, Patent Owner argues Petitioner’s contention that its argument extends to claim 15 is baseless because neither claim 15 nor any of the claims from which claim 15 depends recites a signal detection circuit. *Id.* at 82–83.

b. Our review

We agree with Patent Owner that “includes” has a straightforward, plain meaning and based on its plain meaning, a POSITA would understand the claim language as requiring that the USB routing switch contains the signal detection circuit as part of a whole or group. *See* PO Resp. 83–84 (citing Merriam-Webster Online Dictionary (Ex. 2011)); Ex. 2001 ¶ 116 (“[b]ecause of the functional relationship between the signal detection circuit and the routing switch, it would be natural to implement a routing switch that includes the signal detection circuit”). The claim language covers, for

example, an arrangement of two separate, physical collections of transistors (one set for a switch and another set for a signal detection circuit) that are part of a group of circuitry, for example, part of the same IC (integrated circuit), chip, or module. *See* Ex. 1011, 7:15–21 (describing advantages of grouping different functional components on the same IC); Ex. 1013 ¶ 342 (“[o]ne scenario might be that the switch is on an IC and the signal detection circuit is also on the same IC”); Pet. 99–100.

We conclude the terminology informs with *reasonable* certainty those skilled in the art about the scope of the invention. *Nautilus*, 572 U.S. at 901.

For the reasons discussed above, we conclude Petitioner has not shown by a preponderance of the evidence that claims 4, 9, and 15 are indefinite and therefore invalid under § 112(b).

I. Lack of Written Description Support (Ground 7, Claims 4, 9, 15)

We will discuss the Parties’ arguments and then our analysis.

1. Parties’ Contentions

Petitioner argues the language “wherein the USB routing switch includes the signal detection circuit” in claims 4 and 9 lack written description support for reasons similar to those discussed *supra* in connection with Petitioner’s indefiniteness arguments regarding this language in Ground 6. Pet. 102–103. Petitioner cites claim 15 but does not make any arguments for claim 15. *Id.* Petitioner contends “the specification fails to demonstrate the inventor possessed a ‘switch [that] includes the signal detection circuit.’” *Id.* at 103.

Patent Owner argues the written description inquiry does not turn on the presence or absence of literal support in the specification for the claim

language and the specification need not disclose routine implementation details to satisfy written description. PO Resp. 87 (citing case law). Patent Owner further argues a POSITA reviewing the specification and claims may rely on his or her knowledge and skill in the art and that Petitioner's own expert reviewed the specification (relying on his knowledge and skill in the art), and he recognized that Patent Owner had possession of a number of implementations of the claimed signal detection circuit. PO Resp. 87–88 (citing Ex. 1013 ¶ 342). Patent Owner additionally argues that Petitioner's arguments for claims 4 and 9 do not apply to claim 15 because claim 15 does not recite the signal detection circuit language of claims 4 and 9. PO Resp. 86.

2. Our Review

To satisfy the written description requirement, a patent Specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. *Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1319 (Fed. Cir. 2003).

As discussed above in connection with Ground 6, we find a POSITA would understand the claim language as requiring that the USB routing switch contains the signal detection circuit as part of a whole or group. The '643 patent describes advantages of grouping different functional components on the same IC (integrated circuit). *See* Ex. 1011, 7:15–21. In light of this description in the '643 patent, we are persuaded by Dr. Houh's testimony that "[b]ecause of the functional relationship between the signal detection circuit and the routing switch, it would be natural to implement a

routing switch that includes the signal detection circuit” and that “separate circuits are frequently combined with predictable results.” Ex. 2001 ¶¶ 116, 121. Additionally, Petitioner’s expert Mr. Welch testified “[a] POSITA would have understood a ‘routing switch’ and ‘signal detection circuit’ to be two separate, physical collection of transistors and/or other circuit elements . . . [o]ne scenario might be that the switch is on an IC and the signal detection circuit is also on the same IC.” Ex. 1013 ¶ 342.

We find Petitioner has not met its burden of proving failure to satisfy the written description requirement by a preponderance of the evidence. 35 U.S.C. § 326(e). Additionally, as noted above, Petitioner cites claim 15 but does not make any arguments for claim 15. Pet. 102–103.

For the reasons discussed above, we conclude Petitioner has not shown by a preponderance of the evidence that claims 4, 9, and 15 fail to comply with the written description requirement and therefore invalid under § 112(b).

J. Motions to Exclude/Strike

A. Patent Owner’s Motion to Strike

Patent Owner moves to strike a section of Petitioner’s Reply (Section IV.A.3.b. (Pet Reply 12–15)); paragraphs 6–17 and 44–57 of Exhibit 1102 (Reply Declaration of Eric Welch); and Exhibit 1103 (Excerpts from *The ART of Electronics*, P Horowitz and W. Hill, Cambridge University Press, 2nd Edition (1989)) in its entirety. Paper 35, 1. Petitioner opposes Patent Owner’s Motion to Strike. Paper 36. Patent Owner filed a Reply. Paper 37.

Patent Owner argues that “[t]he Board should grant the Motion because the Reply improperly presents new theories of unpatentability with

belated supporting evidence that could have been present in the Petition itself.” Paper 35, 1. Patent Owner contends that, in response to an argument Patent Owner made in the Response that “Petitioner’s proposed prior art combination features a structural flaw” (*id.* at 2), Petitioner’s Reply improperly presents a new argument not found in the Petition (*id.* at 3–6). We disagree with Patent Owner’s Dead-End Argument and related arguments for the reasons set forth in Section II.F.5.c above. Because Patent Owner’s structural flaw argument is not persuasive, we do not reach the alleged new argument and evidence that Patent Owner seeks to strike. Accordingly, this motion is moot.

For this reason, we deny Patent Owner’s Motion to Strike (Paper 35).

B. Petitioner’s Motion to Exclude Evidence

Petitioner filed a motion to exclude a number of Patent Owner’s exhibits (Exs. 2001–2003, 2005–2010, 2017, 2019, 2024–2028, 2030–2042, 246) on various grounds. Paper 43, 1. Patent Owner filed an Opposition to the motion (Paper 45) and Petitioner filed a Reply in support of the motion (Paper 46).

Exhibits 2001 and 2019 (Houh Declarations)

Exhibit 2001 is the Declaration of Henry Houh filed with Patent Owner’s Preliminary Response. Exhibit 2019 is the Supplemental Declaration of Henry Houh filed with Patent Owner’s Response. Petitioner argues, “[t] The Board should exclude Dr. Houh’s testimony in its entirety as

impermissible expert testimony by a lay person (FRE 701^[17]/702^[18]) (*viz.*, expert testimony by a non-expert who does not satisfy the qualifications of a POSITA [person of ordinary skill in the art]) and as being based on an incorrect POSITA standard/definition, making it irrelevant, unreliable, and unfairly prejudicial.” Paper 43, 1. Petitioner’s request to exclude the Houh Declarations is based upon the Board accepting Petitioner’s contention that a POSITA would have knowledge and experience with USB standards and the design and deployment of USB hosts, USB devices, and USB Hubs. *Id.* at 2 (“If the Board agrees [with Petitioner’s definition of a POSITA], it should exclude Dr. Houh’s testimony because: (1) he rendered no opinions under the correct POSITA definition; and (2) he lacks the qualifications of a POSITA.”), 3 (“Thus, if the Board agrees USB experience/knowledge is required, it should exclude Dr. Houh’s testimony as irrelevant and far more prejudicial than probative.”). As discussed *supra* (section II.B.), we do not

¹⁷ Federal Rule of Evidence 701 states: “If a witness is not testifying as an expert, testimony in the form of an opinion is limited to one that is: (a) rationally based on the witness's perception; (b) helpful to clearly understanding the witness's testimony or to determining a fact in issue; and (c) not based on scientific, technical, or other specialized knowledge within the scope of Rule 702.”

¹⁸ Federal Rule of Evidence 702 states: “A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if the proponent demonstrates to the court that it is more likely than not that: (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based on sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert’s opinion reflects a reliable application of the principles and methods to the facts of the case.”

adopt Petitioner’s definition of a POSITA because of the lack of evidentiary support.

Petitioner argues that “[t]he Board should also exclude Dr. Houh’s secondary considerations testimony (re long-felt need, failure/skepticism of others, and copying) at ¶¶139-153 of EX2019 under *Daubert*^[19] and FRE 403^[20].” Paper 43, 1. However, this argument is not well-developed and is largely skeletal and conclusory. Nonetheless, to the extent Petitioner’s argument is explained, we consider it.

With regard to long-felt need, Petitioner argues that Dr. Houh’s testimony does not establish that any alleged need was long-felt. Paper 43, 6. Petitioner argues:

[B]y Dr. Houh’s own admission ([Ex. 2019] ¶41), Apple informed “automakers of its plans to release a new technology known as CarPlay” “around 2013,” the same year the patent was filed. That cannot constitute long-felt need and Dr. Houh’s self-contradictory “long-felt need” testimony is a waste of time, unfairly prejudicial, unreliable, lacks foundation / personal knowledge, and should be excluded.

Id. (citing Ex. 2019 ¶¶ 141–143). Thus, Petitioner challenges Dr. Houh’s testimony on long-felt need on the merits. As discussed *supra* (section II.F.8.c), even considering Dr. Houh’s testimony, we find that Patent Owner fails to establish that there existed a long felt but unsatisfied need for the invention claimed in the ’643 patent. Although we consider Petitioner’s

¹⁹ *Daubert v. Merrell Dow Pharms, Inc.*, 508 U.S. 579 (1993).

²⁰ Federal Rule of Evidence 403 states that, “[t]he court may exclude relevant evidence if its probative value is substantially outweighed by a danger of one or more of the following: unfair prejudice, confusing the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence.”

challenge to these paragraphs to have some merit especially as Dr. Houh “lacks automotive industry expertise and has no independent knowledge or qualifications to opine on car maker’s wishes” (*id.*), it is unnecessary to exclude this testimony as requested by Petitioner as we find in Petitioner’s favor on long-felt need even considering this testimony and giving it appropriate weight.

Petitioner requests that we exclude paragraphs 144–146 of Dr. Houh’s testimony related to failure/skepticism of others. Paper 43, 6. However, in arguing “[f]ailure of others/skepticism of skilled artisans,” Patent Owner does not discuss, cite, or otherwise rely on Dr. Houh’s testimony. *See* PO Resp. 55–60. Petitioner does not direct our attention to any use of this testimony by Patent Owner. *See* Paper 43, 6. Accordingly, we did not consider this testimony in determining whether Patent Owner had shown “[f]ailure of others/skepticism of skilled artisans.” *See* Section II.F.8.c.iii.

Petitioner requests that we exclude paragraphs 138–144 of Dr. Houh’s testimony related to copying. In its argument regarding copying, Patent Owner does not discuss, cite, or otherwise rely on paragraphs 138–143. *See* PO Resp. 64–68. And, we did not rely on this testimony or the testimony in paragraph 144 in deciding whether Patent Owner had shown copying. *See* Section II.F.8.c.vi. In analyzing copying *infra* (*see id.*), we determine that Patent Owner’s allegations of copying by Petitioner are not well-supported without considering Dr. Houh’s testimony on copying.

In summary, Petitioner fails to show that Dr. Houh’s Declarations (Exhibits 2001 and 2019) should, in whole or in part, be excluded.

Remaining Challenged Exhibits

The additional exhibits that Petitioner requests that we exclude were used by Patent Owner to support its arguments relating to secondary considerations or were not cited by Patent Owner. *See* Paper 43, 7–15; PO Resp. 49–70.

Petitioner acknowledges that Exhibits 2017, 2024, 2043 were not cited by Patent Owner. Paper 43, 8, 14. Petitioner requests that we exclude Exhibit 2035 (*id.* at 10), but does not allege that it is cited by Patent Owner (*see id.* at 11). We could find no discussion or citation of, or reliance by Patent Owner, on Exhibit 2035. *See generally* PO Resp. We did not rely on these exhibits.

With regard to the remaining challenged exhibits, as acknowledged by Petitioner (*id.*), these exhibits are used by Patent Owner to establish secondary considerations of non-obviousness or nexus. *See also* PO Resp. 49–70. As discussed *supra* (section II.F8.c.), we find in Petitioner’s favor in that we determine that the secondary considerations evidence offered by Patent Owner lacks sufficient weight in view of the Petitioner’s evidence of obviousness and that Patent Owner fails to show a nexus between its secondary considerations evidence and the claimed invention. In weighing the evidence of secondary considerations and nexus, we were also cognizant of Petitioner’s objections to these exhibits and accordingly gave them appropriate weight.

For these reasons, we deny Petitioner’s Motion to Exclude Evidence (Paper 43).

III. CONCLUSION

For the reasons discussed above, Petitioner has shown by a preponderance of the evidence that claims 1–15 of the '643 patent are unpatentable.²¹

²¹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–15	103	Obviousness over Chang in view of Chang II and POSITA Knowledge	1–15	
2, 7, 13	103	Obviousness over Chang in view of Chang II, Chutorash, and POSITA Knowledge	2, 7, 13	
1–15	112(b)	Indefinite (“the USB hub and USB bridge have different components and functionality”)		1–15
1–15	112(b)	Indefinite (“routing logic circuit”)		1–15
1–9	112(b), 112(f)	Indefinite (“signal detection circuit”)		1–9
4, 9, 15	112(b)	Indefinite (“the USB routing switch includes the signal detection circuit”)		4, 9, 15
4, 9, 15	112(a)	Written Description		4, 9, 15
Overall Outcome			1–15	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–15 of the '643 patent are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Strike (Paper 35) is *denied*; and

FURTHER ORDERED that Petitioner's Motion to Exclude (Paper 43) is *denied*; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of this Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

PGR2024-00011
Patent 11,681,643 B2

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE OFFICE OF THE UNDER SECRETARY OF COMMERCE
FOR INTELLECTUAL PROPERTY AND DIRECTOR OF THE
UNITED STATES PATENT AND TRADEMARK OFFICE

MICROCHIP TECHNOLOGY INC.,
Petitioner,

v.

APTIV TECHNOLOGIES AG,
Patent Owner.

IPR2024-00228 (Patent 9,619,420 B2)
IPR2024-00229 (Patent 9,645,962 B2)
IPR2024-00230 (Patent 11,176,072 B2)
PGR2024-00011 (Patent 11,681,643 B2)¹

Before COKE MORGAN STEWART, *Acting Under Secretary of
Commerce for Intellectual Property and Acting Director of the United States
Patent and Trademark Office.*

ORDER

¹ This order applies to each of the above-listed proceedings.

IPR2024-00228 (Patent 9,619,420 B2)
IPR2024-00229 (Patent 9,645,962 B2)
IPR2024-00230 (Patent 11,176,072 B2)
PGR2024-00011 (Patent 11,681,643 B2)

The Office received a request for Director Review of the Final Written Decision in each of the above-captioned cases and an authorized response to each request. *See* Papers 62, 63.²

Having considered the requests and responses, it is:

ORDERED that the requests for Director Review are denied.

² Citations are to the record in IPR2024-00228. The parties filed similar papers in IPR2024-00229, IPR2024-00230, and PGR2024-00011.

IPR2024-00228 (Patent 9,619,420 B2)
IPR2024-00229 (Patent 9,645,962 B2)
IPR2024-00230 (Patent 11,176,072 B2)
PGR2024-00011 (Patent 11,681,643 B2)

FOR PETITIONER:

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